# SPILLS ACTION CENTRE

# SUMMARY REPORT OF

# 1990 OCCURRENCES

JUNE 1992

Ontario

Environment
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# SUMMARY REPORT OF 1990 OCCURRENCES

Report Prepared By:

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JUNE 1992

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SPILLS ACTION CENTRE
SUMMARY REPORT OF 1990 OCCURRENCES

## EXECUTIVE SUMMARY

This report summarizes occurrences reported to Environment Ontario's Spills Action Centre (SAC) during the 1990 calendar year. It also provides several comparisons to previous years in an attempt to identify significant trends.

In 1990, 15,774 occurrences were reported to SAC and documented on the Ministry's Occurrence Reporting Information System (ORIS). These included: 5,686 environmental spills; 5,419 occurrences classified as notifications (Ministry required notifications other than spills); 4,068 environmental complaints from the public; and 601 occurrences classified as others.

Just over half the spills reported to SAC in 1990 involved oils or fuels. Chemicals or chemical solutions, wastes or wastewaters and gaseous spills accounted for the other half. A large portion of these reported spills involved small quantities: about 18% were less than 10 litres, 51% were less than 100 litres and 83% were less than 1,000 litres.

Less than 10% of the 5,686 environmental spills had a confirmed impact identified. Two-thirds of these involved soil contamination, while the bulk of the remainder involved surface water contamination. Only 13 had impacts on human health or safety, while 10 had confirmed adverse effects on wildlife.

Spill cleanup information in this report indicates that spills to land are normally easier to clean up than spills to water, while spills to air--because they usually involve escaped gases--are virtually impossible to clean up. About half of the spills to land were completely cleaned up and 80% were more than half cleaned up. By comparison, less than 20% of spills to water were cleaned up to any extent and no cleanup was undertaken on any spills to air.

The industrial sectors with the largest number of reported spills were: transportation (14.7%); petroleum (12.5%); chemical (10.8%); and metallurgical (8.4%). Combined public sector spills, such as those from hydroelectric utilities and sewage treatment systems, accounted for about 20% of reported spills.

Almost one-third of the 5,686 spills reported were either entirely or partly discharged to water. Of these, 333 involved oil or chemical discharges to the Great Lakes System, including: 111 to Lake Ontario, 73 to the St. Clair River, 67 to the St. Lawrence River and 26 to Lake Erie. The remainder were spills to Lake Superior, the Detroit River, Lake Huron, the St. Mary's River, the Niagara River and Georgian Bay.

**Comparison to previous years**

Occurrences reported to SAC increased about 20% each year between 1986 and 1989. This trend changed in 1990 when 87 fewer occurrences were reported than in 1989. The drop in occurrences is attributed to a decrease in environmental complaints and fewer occurrences documented as others. The number of environmental spills reported to SAC in 1990 actually increased by 6.4% over 1989. This increase is small compared to a 31.3% increase in reported spills from 1988 to 1989.

**How this data is used**

Occurrence summaries presented in this report, along with additional information from the ORIS database, assist the ministry and others, such as Environment Canada and the International Joint Commission on the Great Lakes, in identifying and responding to environmental problems.

Ministry pollution abatement programs and spill reduction initiatives are developed or modified as trends or concerns are identified using this type of information. For example, the Ministry has implemented a province-wide spills prevention strategy requiring repeat spillers to submit spill prevention and response plans to the Ministry and to incorporate better management practices. About 30 companies are currently involved in this process.

# INTRODUCTION

This report provides a summarized review of the occurrences reported to Environment Ontario's Spills Action Centre (SAC) during the calendar year of 1990. Part I of the report deals with all occurrences reported to SAC while Part II focuses on spills. Part III provides additional information on spills to the Great Lakes.

The Centre began operations on November 29, 1985, the same day that Part IX of the Environmental Protection Act ("Spills Bill") came into force. SAC operates a province-wide toll-free number for receiving reports of spills and other urgent environmental matters on a 24 hour-per-day basis. SAC environmental officers evaluate all occurrences reported to them and decide the appropriate action to be taken. This may include the following:

- Contacting suspected problem sources in an attempt to verify and resolve the problem;
- Contacting local Ministry of the Environment (MOE) personnel to initiate a field response when necessary;
- Contacting other agencies or potentially affected parties as needed, for example, police, fire departments, ambulance, local municipal authorities, Coast Guard, US authorities, etc.;
- Notifying senior MOE management if the incident is serious, and co-ordinating information flow to the public;

- Contacting the Minister's office and conveying orders or directions from the Minister where necessary;

- Maintaining liaison with the agencies in charge of public safety in an emergency and co-ordinating MOE's support for their efforts;

- Providing ministry staff and others with information on chemicals and cleanup techniques, either directly or through CANUTEC, Transport Canada's national 24-hour centre;

- Recording the details of non-urgent incidents and sending them to the appropriate district office or other agencies for response during normal business hours.

Regardless of what action is initiated, all occurrences are recorded on a computerized data management system. Each occurrence is classified into one of four categories: Spills, Notifications, Complaints, or Others (these categories are described in detail in Part I of this report). Since January 1, 1988 all incidents reported to SAC have been documented on a relational data management system which is called the Occurrence Reporting Information System (ORIS). The system enables the Ministry to track the status of occurrences and facilitates routine summaries and non-routine data searches. Each occurrence record consists of a text summary identifying the main elements of the incident. Several fields are coded to facilitate data retrieval. A sample occurrence report is included in Appendix I and a listing of coding categories used for ORIS is included in Appendix II.

The information presented in this document represents SAC's third calendar year summary of ORIS data. While the summaries presented have gone through numerous checks and balances they should not be viewed as being absolute or error free. Information that comes

in during spills and emergencies is not always exact and frequently changes. SAC environmental officers are required to exercise discretion when entering codes or other data relating to an occurrence. Since ORIS is a relational database, any updates made to occurrence data will affect the currency of past data summaries. Therefore, to a certain extent the information presented in this report is a "snapshot" of the information that existed on the system at the time summaries were generated.

# PART I

## OCCURRENCES IN GENERAL

The Spills Action Centre was established in anticipation of a greater number of reportable spills resulting from tougher spills legislation and an overall increase in environmental awareness. As SAC's province-wide, toll-free number has become better known, it has been used increasingly not only for reporting spills but also for numerous other environmental matters. This part of the report reviews all of the occurrences reported to SAC in 1990. Part II and III will focus specifically on spills.

### TYPES OF OCCURRENCES

All occurrences reported to SAC are classified into one of the following four occurrence categories:

Spills: Part IX of the Environmental Protection Act defines a spill as a discharge of a pollutant which may have adverse effects, into the natural environment, where the discharge is from a container or structure and is abnormal in light of all circumstances. A spill must be reported and cleaned up if it causes or is likely to cause adverse effects.

Notifications: This category, which is sometimes referred to as "notifiable discharges other than spills", is used to classify a range of ministry notifications, including reports to the Ministry required through legislation or regulation such as Sections 12 and 14 of the Environmental Protection Act, or Section 9 of Regulation 308. Also included are reports made as a condition of operation in a Certificate of Approval, or other conditions

of operation which require a facility to report certain deviations in operations or fluctuations in discharges of contaminants. Notifications made in accordance with interjurisdictional agreements are also included in this category. It is important to note that the distinction between the spill category and the notification category is not always clear and some notifiable discharges may be borderline or quasi-spills. In fact, during SAC's first year of operation, the two categories were grouped together and both referred to as spills. However, since March 1987 SAC has applied the more rigorous definition of a spill found in Part IX of the Environmental Protection Act, and the notification category has been kept separate. The spill and notification categories combined are sometimes referred to as "reportable occurrences".

Complaints: These are reports received from the public which involve environment related problems or concerns. Complaints are often directed at specific pollution sources and include expressions of concern over noise, odour, dust, smoke, etc. The vast majority of all complaints documented at SAC are received during the hours when local Ministry offices are closed.

Others: Occurrences which do not fall into the preceding categories are classified in this category. These include occurrences such as a hazardous material release that was contained in a building or spilled inside an enclosed truck (i.e., NOT released to the natural environment), or reports of spill training exercises. SAC also makes use of this category to track the status of data requests.

## MINISTRY RECORDS

SAC is responsible for maintaining spill records for the entire Ministry. Spills may be reported to the Centre in one of two ways. First, they may be reported directly by the discharger, other government agencies, or the public, which accounts for the majority of spills reported. Second, they may be reported indirectly via other ministry offices. Ministry staff who receive spill reports are instructed to relay the relevant information to SAC as soon as possible to ensure staff at the Centre are aware of the incident, and to allow for prompt documentation. Therefore, spill summaries presented throughout this report represent all spills reported to the Ministry.

SAC does not maintain complete Ministry records for complaints, notifications or other occurrences handled by the Ministry, since such record keeping is primarily the responsibility of each district office. These types of occurrences are reported to SAC primarily during "off-hours" when the district offices are closed. Complaints and notifications being reported during regular business hours and received directly by the district offices are not forwarded to SAC. As a result, SAC records do not reflect Ministry totals for these categories. Therefore, the non-spill summaries presented in this report (e.g. complaints and notifications) do not reflect complete Ministry totals.

## OCCURRENCE SUMMARIES

The summaries presented in this report are based on the date the occurrence was reported to SAC. If a spill occurred in 1989 but was not reported and documented at SAC until 1990, then it appears in the 1990 Summary Report. The occurrence date is not used as the basis for summaries because, for some incidents, the date of occurrence is not known. All spill incidents reported by telephone or fax to SAC are entered into the ORIS database the same day they are reported. Spills reported to SAC after the fact, via subsequent ministry

field reports, are entered on a lower priority basis. For these reports, the differences between the date of occurrence, date reported to MOE and date reported to SAC can be significant. Of the 5,686 spills which are documented in this 1990 summary, 93 (1.6%) actually occurred in 1989 but were not entered into the database until 1990.

This part of the report makes use of five figures and one table to summarize the nature and trends of occurrences reported to SAC. The information presented by these illustrations is outlined in the following series of paragraphs. The actual illustrations appear sequentially after the text.

The increase in the total number of occurrences reported to SAC from 1986 to 1990 is shown in Figure 1. It shows a steady increase in reported occurrences during the first four years that SAC was in operation. However, the 1989 and 1990 results suggest that reported occurrences have levelled off at between 15,000 and 16,000 per year. Figure 2 provides a breakdown of occurrence by types for three calendar years - 1988, 1989 and 1990. It shows that while spill reporting increased slightly from 1989 to 1990 the rate of increase has gone down substantially; that is, the rate of increase of spill reporting from 1988 to 1989 was 31.3%, while the corresponding increase from 1989 to 1990 was only 6.4%. The total numbers of notifications, complaints and other reported occurrences decreased in 1990 compared to the 1989 totals, as shown in Figure 2.

Figure 3 provides a breakdown of occurrences by type for 1990; spills accounted for 36% of the total, notifications 34%, environmental complaints 26%, and other occurrences accounted for 4%. In total, 70% of all occurrences dealt with by SAC required reporting and can be considered reportable occurrences.

Table 1 provides a breakdown, by MOE Region and District, of all occurrences documented by SAC. These results are shown graphically in Figure 4. The large number

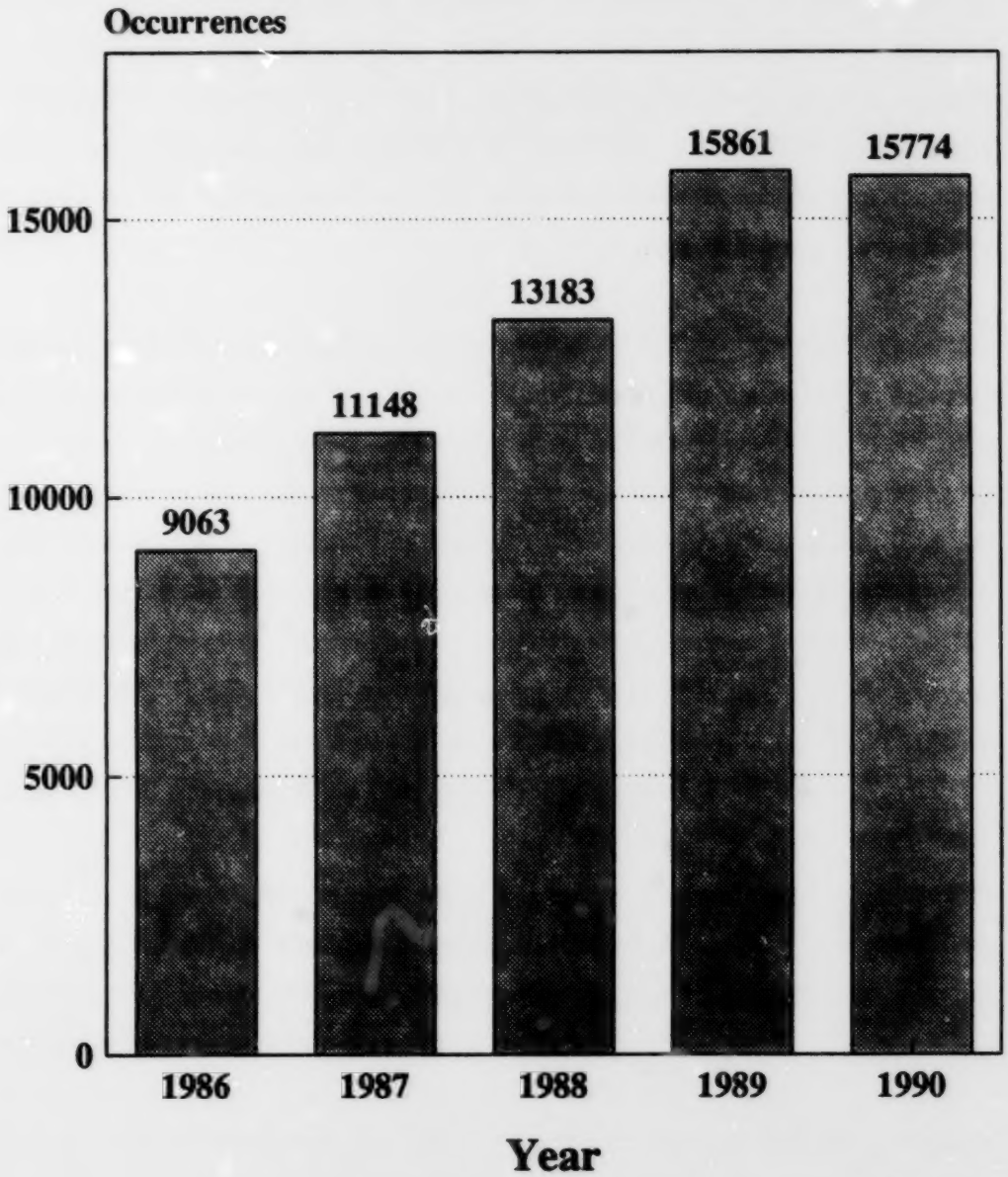
of notifications shown in Figure 4 for the Hamilton district are related to the areas' steel making operations.

Seasonal fluctuations in the four occurrence categories reported to SAC in 1990 are shown in Figure 5. As was the case in previous years, it can be seen that SAC dealt with more occurrences during the warmer months than during the colder months. The pattern, to a large extent, is due to an increase in environmental complaints received during the warmer months when a greater number of people are involved in outdoor activities and more likely to observe environmental problems.

Additional information on the off-hour complaints to the Ministry received by SAC is presented in Appendices III, IV and V.

**Figure 1**

# Occurrence Totals By Year



## Figure 2
# Occurrences By Type and Year

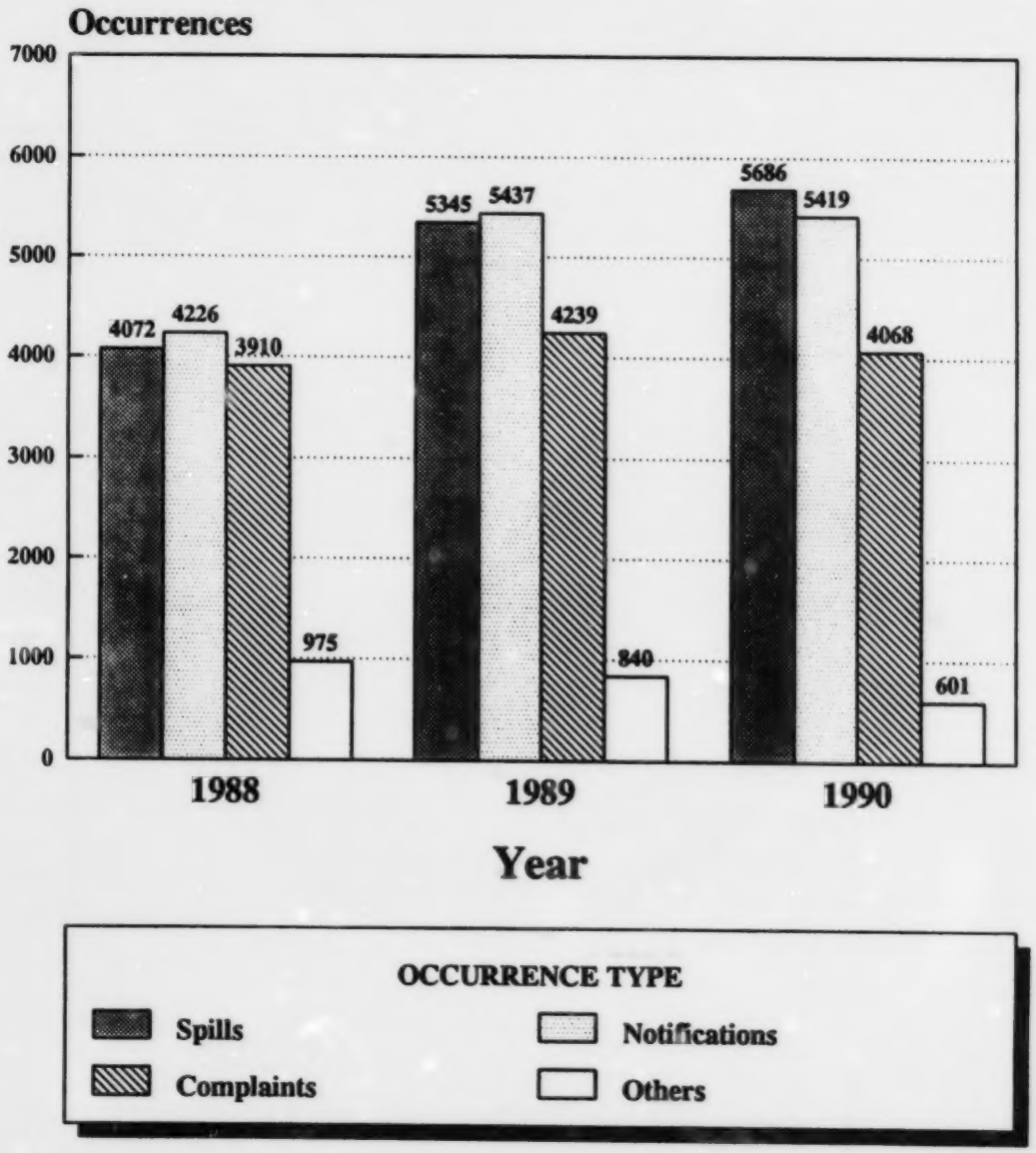
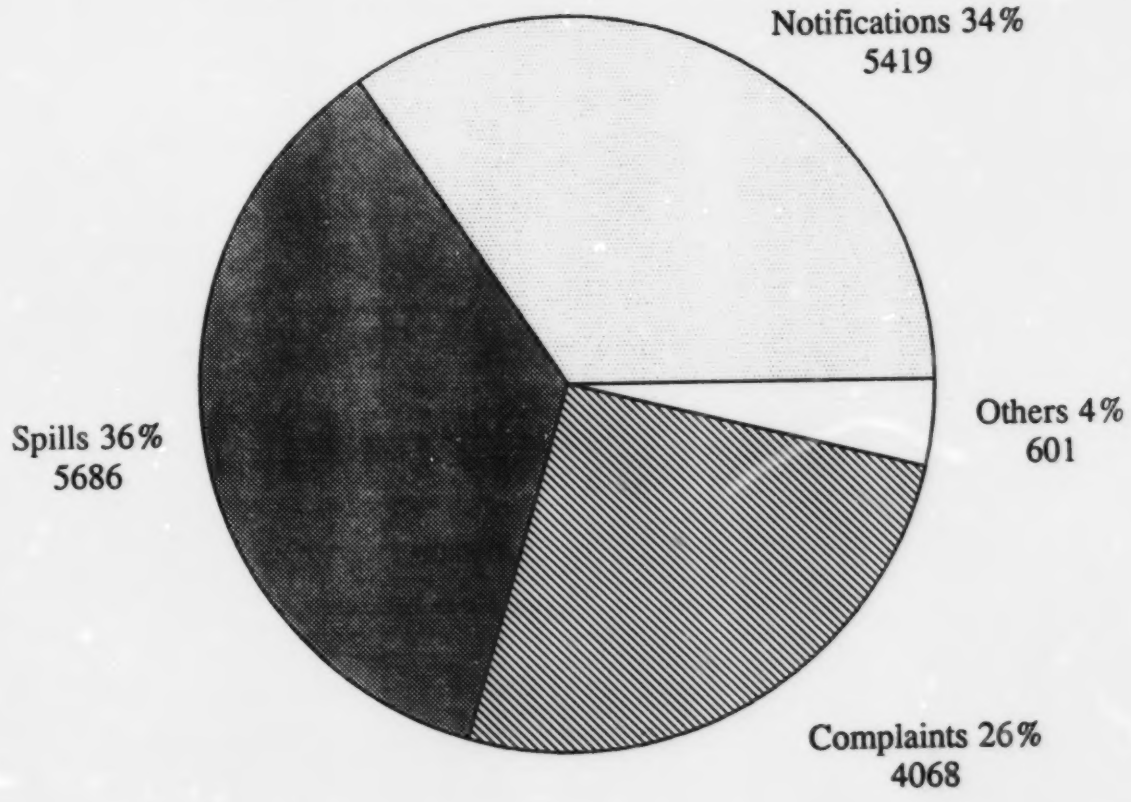


**Figure 3**

# Occurrence Totals




A total of 15 774 Occurrences
were reported to SAC in 1990

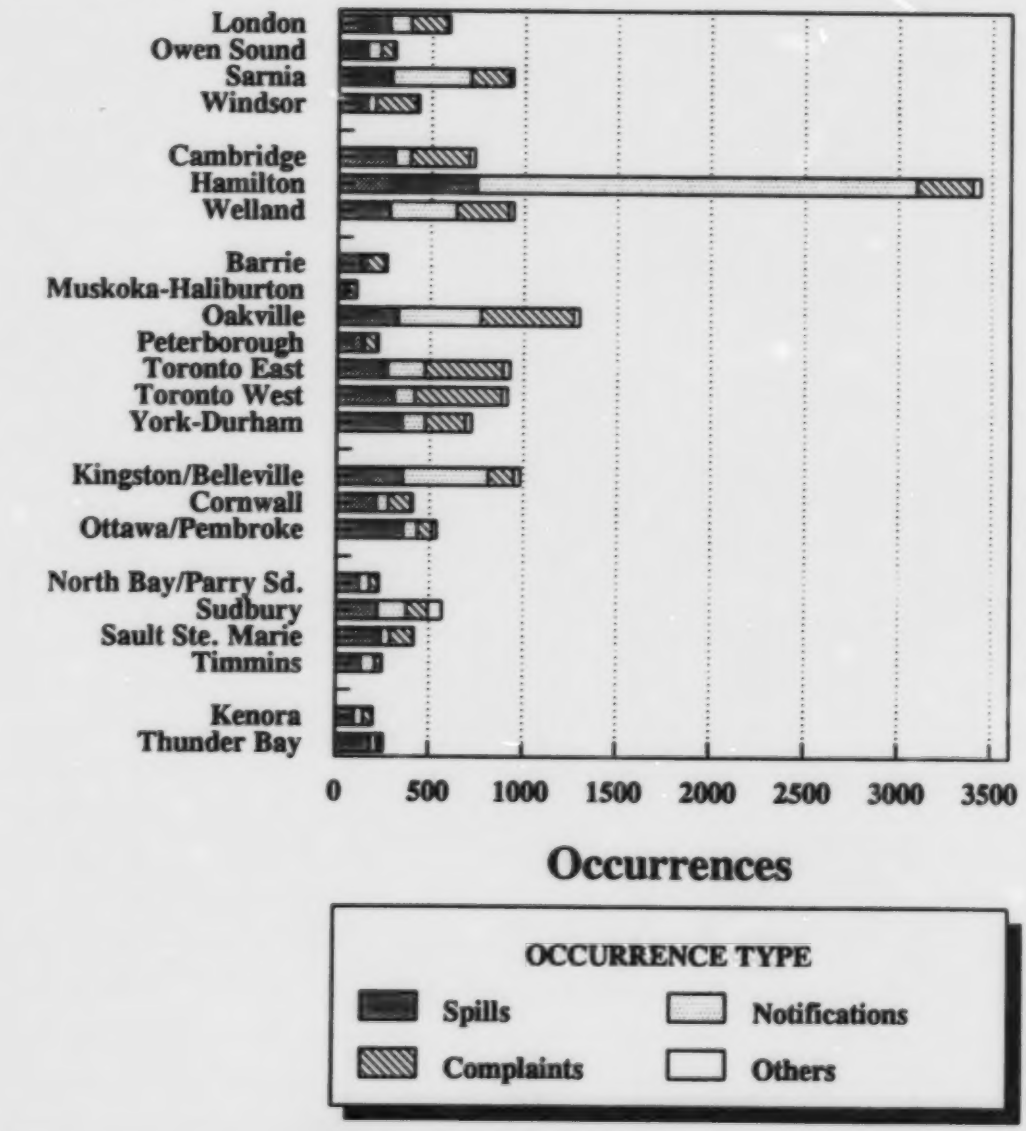
## TABLE 1

## REGIONAL BREAKDOWN OF ALL OCCURRENCES REPORTED TO SAC

| REGION | DISTRICT | OCCURRENCE TYPE | | | | TOTAL |
|---|---|---|---|---|---|---|
| | | Spills | Notifi-cations | Complaints | Others | |
| Southwest | London | 274 | 114 | 191 | 17 | 596 |
| | Owen Sound | 151 | 77 | 62 | 13 | 303 |
| | Sarnia | 285 | 425 | 206 | 21 | 937 |
| | Windsor | 154 | 48 | 211 | 18 | 431 |
| | **SUB-TOTAL** | **864** | **664** | **670** | **69** | **2267** |
| West Central | Cambridge | 302 | 85 | 315 | 31 | 733 |
| | Hamilton | 743 | 2356 | 298 | 42 | 3439 |
| | Welland | 279 | 356 | 278 | 29 | 942 |
| | **SUB-TOTAL** | **1324** | **2797** | **891** | **102** | **5114** |
| Central | Barrie | 132 | 24 | 96 | 13 | 265 |
| | Muskoka - Haliburton | 42 | 14 | 44 | 4 | 104 |
| | Oakville | 325 | 445 | 496 | 31 | 1297 |
| | Peterborough | 135 | 12 | 65 | 8 | 220 |
| | Toronto East | 269 | 203 | 418 | 36 | 926 |
| | Toronto West | 307 | 113 | 465 | 30 | 915 |
| | York-Durham | 351 | 125 | 213 | 33 | 722 |
| | **SUB-TOTAL** | **1561** | **936** | **1797** | **155** | **4449** |
| Southeast | Cornwall | 215 | 65 | 120 | 8 | 408 |
| | Kingston | 354 | 458 | 138 | 33 | 983 |
| | Ottawa | 357 | 75 | 79 | 24 | 535 |
| | **SUB-TOTAL** | **926** | **598** | **337** | **65** | **1926** |
| Northeast | North Bay | 125 | 56 | 41 | 7 | 229 |
| | Sudbury | 222 | 155 | 115 | 75 | 567 |
| | Sault Ste. Marie | 241 | 51 | 119 | 9 | 420 |
| | Timmins | 133 | 79 | 32 | 4 | 248 |
| | **SUB-TOTAL** | **721** | **341** | **307** | **95** | **1464** |
| Northwest | Kenora | 100 | 49 | 45 | 7 | 201 |
| | Thunder Bay | 190 | 34 | 21 | 14 | 259 |
| | **SUB-TOTAL** | **290** | **83** | **66** | **21** | **460** |
| SAC | Data Requests | 0 | 0 | 0 | 94 | 94 |
| **ALL** | **TOTAL** | **5686** | **5419** | **4068** | **601** | **15774** |

## Figure 4

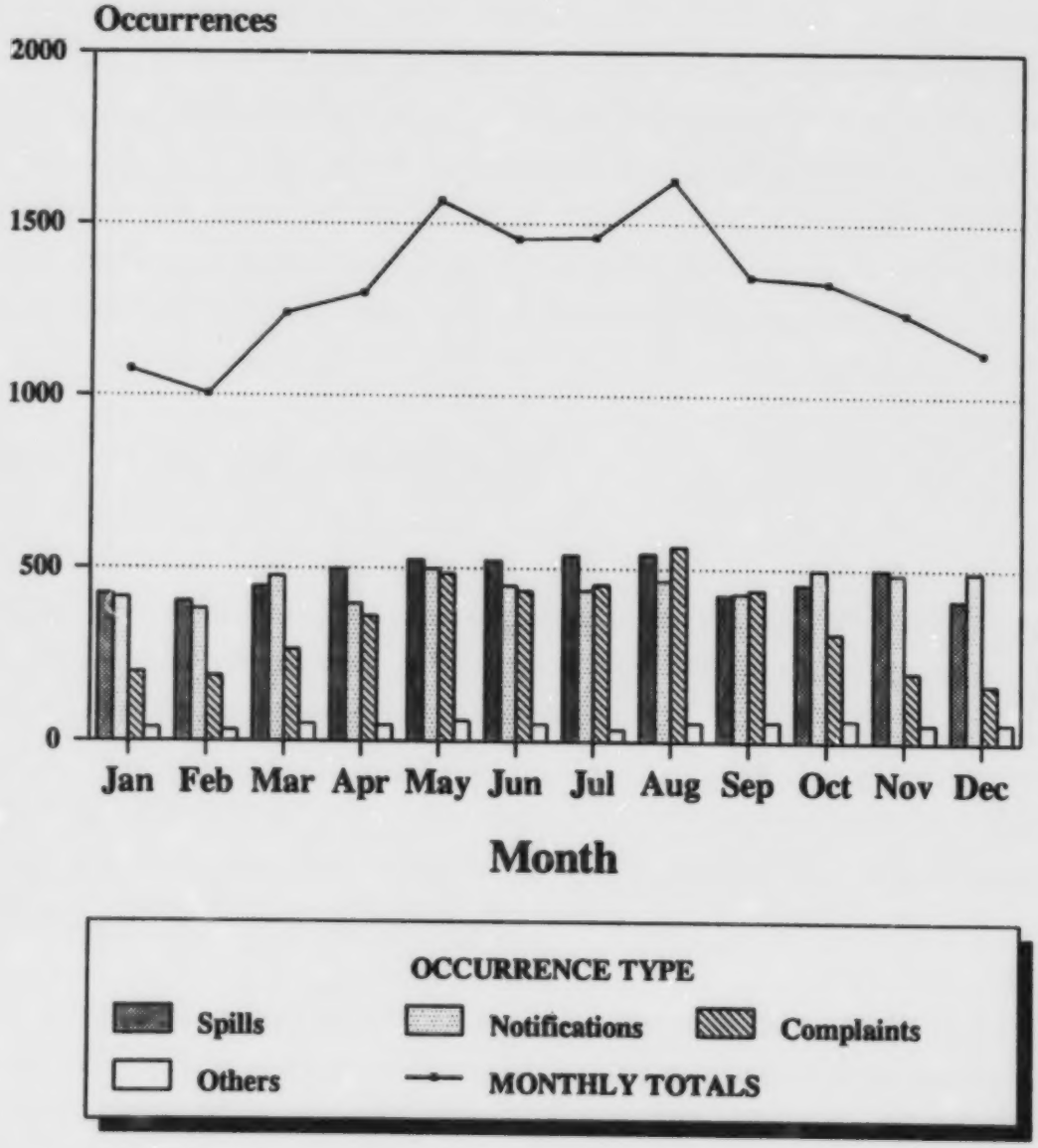
# Occurrences By Type & District




**Reported Occurrences: 15 774**

## Figure 5

# Occurrences By Type & Month



# PART II
# SPILLS

This part of the report provides a more detailed review of the number and type of spills reported to SAC in 1990. It also provides some comparisons to the spill results obtained in 1988 and 1989. The various spill related categories presented in this report are generally consistent with those used by Environment Canada in their National Analysis of Trends in Emergencies System (the NATES program). The NATES codes were originally developed in an attempt to standardize spill reporting results across the country and facilitate the exchange of spill related data. To the extent practicable, Ontario has adopted the NATES coding categories.

## SPILLS TO AIR, LAND AND WATER

Table 2 summarizes spills by medium (i.e. spills to air, land, and water) as well as multiple media spills. It also provides a comparison to the 1988 and 1989 results. While the number of spills in each category has increased from 1988, the relative percentages of each category for each calendar year are quite similar.

There were 649 spills to air in 1990. Releases to the atmosphere which have been classified as notifications, such as sulphur dioxide exceedences or minor releases during changes in industrial operating conditions, are excluded from this total.

The spills to land category accounts for the largest portion of spills - 55.3% or 3,144 spills. Most spills to land are readily cleaned up using the resources of the discharger, clean-up contractors, co-operatives, or municipalities. This topic is discussed in more detail in the section dealing with spill cleanup.

**TABLE 2**

**SPILLS BY MEDIUM**

| SPILLS RELEASED TO | 1990 | | 1989 | | 1988 | |
|---|---|---|---|---|---|---|
| | SPILLS | % | SPILLS | % | SPILLS | % |
| Land | 3144 | 55.3 | 2996 | 56.1 | 2261 | 55.5 |
| Water | 1305 | 23.0 | 1135 | 21.2 | 969 | 23.8 |
| Air | 649 | 11.4 | 776 | 14.5 | 543 | 13.3 |
| Land and Water | 467 | 8.2 | 355 | 6.6 | 243 | 6.0 |
| Air and Land | 98 | 1.7 | 75 | 1.4 | 51 | 1.3 |
| Air and Water | 23 | 0.4 | 8 | 0.2 | 5 | 0.1 |
| TOTALS | 5686 | 100.0 | 5345 | 100.0 | 4072 | 100.0 |

There were 1,305 occurrences which were documented as spills to water in 1990. This number excludes all of the minor contaminant exceedences to watercourses, which are required to be reported to the Ministry as conditions of operation. Such occurrences are documented as notifications and therefore do not appear in the spill summaries.

The spills to water category in Table 2 includes 333 spills of oils, chemicals, or chemical solutions, discharged directly to the Great Lakes and interconnecting channels during 1990. A more detailed review of oil and chemical spills to the Great Lakes is provided in Part III of this report. These are dealt with separately and in more detail because of the significance of the Great Lakes System to Ontario and the Ministry's commitment to provide certain information to the International Joint Commission on the Great Lakes.

## TYPES OF MATERIALS SPILLED

Table 3 is a tabulation of spills by material type and MOE region. The total number of materials spilled (5,991) exceeds the total number of spills reported to SAC in 1990 (5,686). This discrepancy is attributable to a number of spill occurrences which involved two or more spilled materials.

Oils constitute 52.5% (3,144) of all reported spilled materials. Gasoline, fuel oils and light petroleum oils account for most of these with many being operating fuels discharged as a result of transportation accidents or fuel leaks from fixed storage facilities.

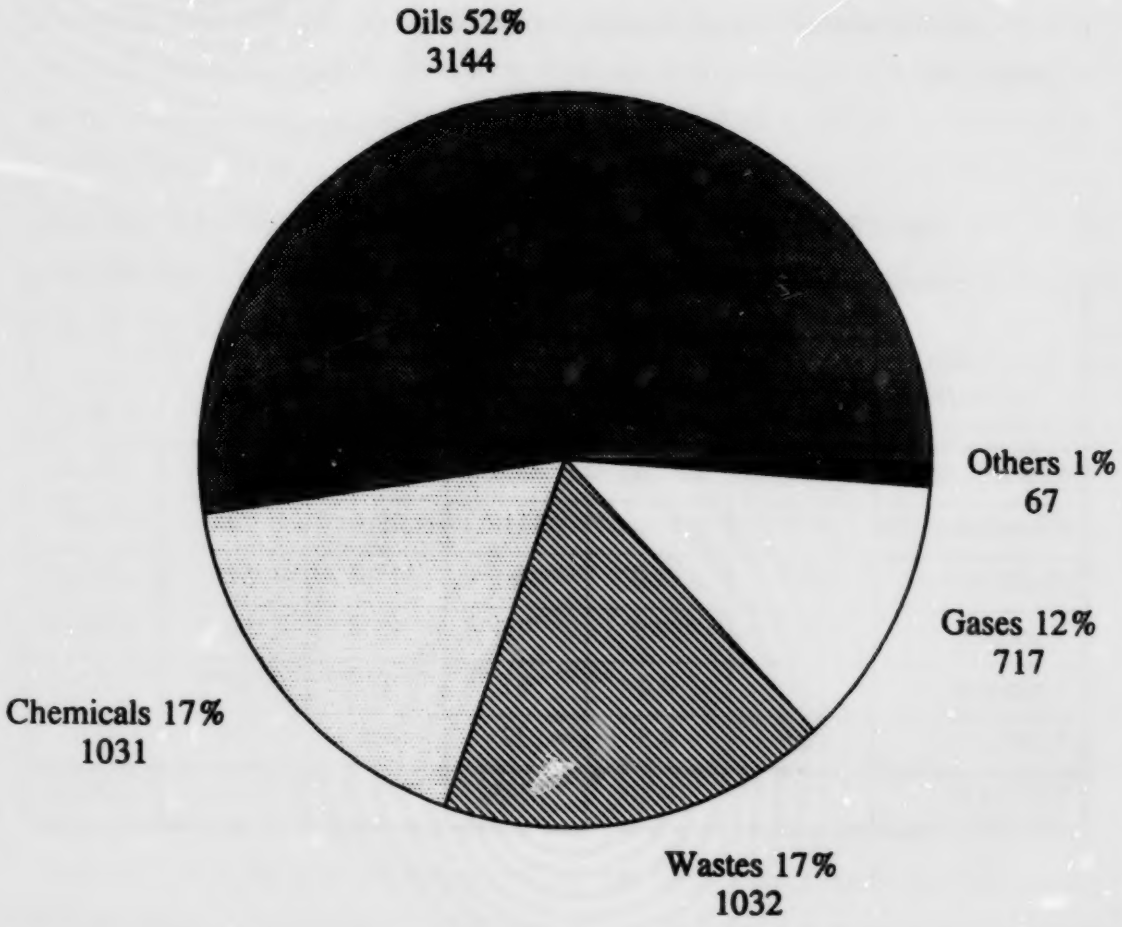
The second largest category of spilled materials is chemicals which include chemical solutions. These substances are often referred to as environmentally hazardous materials and comprise 17.2% of all materials spilled. As was the case in 1988 and 1989, the two largest chemical sub-categories are "other organic" and "other inorganic" which together account for just over half of all chemical spills and 8.9% of all materials spilled. Spills involving PCBs (Polychlorinated Biphenyls) in concentrations greater than 50 parts per million account for 11.0% of chemical spills and 1.9% of all spills reported to SAC in 1990 - down from 2.4% of all spills reported in 1989.

Figure 6 graphically illustrates the breakdown of spills by the major material categories i.e. oils, chemical or chemical solutions, wastes, gases and others.

# TABLE 3
# SPILLS BY MATERIAL AND REGION

| MATERIAL GROUP | | NOE REGION | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | SW | WC | C | SE | NE | NW | |
| OILS | Crude | 8 | 1 | 4 | 0 | 0 | 0 | 13 |
| | Gasoline/Jet Fuel | 105 | 94 | 270 | 113 | 62 | 38 | 682 |
| | Light Petroleum Oils | 300 | 329 | 673 | 380 | 225 | 117 | 2024 |
| | Heavy Petroleum Oils | 33 | 68 | 37 | 25 | 15 | 10 | 188 |
| | Other Petroleums | 48 | 50 | 52 | 27 | 21 | 9 | 207 |
| | Non-Petroleum Oils | 5 | 13 | 9 | 1 | 1 | 1 | 30 |
| | SUB-TOTAL | 499 | 555 | 1045 | 546 | 324 | 175 | 3144 |
| CHEMICALS | Acids | 13 | 30 | 33 | 52 | 9 | 3 | 140 |
| | Bases | 9 | 5 | 10 | 7 | 1 | 4 | 36 |
| | Halogenated Solvents | 7 | 2 | 16 | 3 | 1 | 0 | 29 |
| | Non-Halogenated Solvents | 34 | 26 | 39 | 7 | 4 | 2 | 112 |
| | Pesticides | 9 | 17 | 13 | 6 | 15 | 5 | 65 |
| | PCB's | 30 | 16 | 48 | 7 | 6 | 6 | 113 |
| | Other Organic Chemicals | 49 | 64 | 82 | 54 | 16 | 12 | 277 |
| | Other Inorganic Chemicals | 35 | 72 | 56 | 57 | 22 | 17 | 259 |
| | SUB-TOTAL | 186 | 232 | 297 | 193 | 74 | 49 | 1031 |
| GASES | Smoke | 20 | 140 | 35 | 10 | 13 | 0 | 218 |
| | Dust/Particulate | 14 | 70 | 16 | 15 | 7 | 1 | 123 |
| | Nitrous Oxides | 1 | 2 | 0 | 25 | 1 | 0 | 29 |
| | Sulphurous Oxides | 2 | 2 | 5 | 1 | 11 | 0 | 21 |
| | Natural Gas (Methane) | 4 | 5 | 9 | 8 | 3 | 0 | 29 |
| | Other Gases | 64 | 122 | 36 | 50 | 13 | 12 | 297 |
| | SUB-TOTAL | 105 | 341 | 101 | 109 | 48 | 13 | 717 |
| WASTES | Liquid Industrial | 28 | 137 | 28 | 14 | 121 | 21 | 349 |
| | Hazardous Solid | 1 | 3 | 2 | 3 | 4 | 1 | 14 |
| | Non-Hazardous Solid | 6 | 9 | 18 | 5 | 39 | 4 | 81 |
| | Sewage | 28 | 60 | 60 | 70 | 72 | 27 | 317 |
| | Agricultural Wastes | 23 | 10 | 1 | 1 | 1 | 0 | 36 |
| | Other Wastes | 33 | 69 | 49 | 25 | 49 | 10 | 235 |
| | SUB-TOTAL | 119 | 288 | 158 | 118 | 286 | 63 | 1032 |
| OTHERS | Feed & Foodstuff | 2 | 3 | 4 | 3 | 0 | 0 | 12 |
| | Unknown | 8 | 8 | 16 | 2 | 3 | 0 | 37 |
| | Other Materials | 1 | 1 | 4 | 2 | 10 | 0 | 18 |
| | SUB-TOTAL | 11 | 12 | 24 | 7 | 13 | 0 | 67 |
| TOTALS | | 920 | 1428 | 1625 | 973 | 745 | 300 | 5991 |

## Figure 6
# Spills By Material Group



A three year comparison of spills by material types is provided in Table 4. The relative percentages of each major material category are shown along with the actual number of materials spilled. The results presented in Table 4 show that there have not been any significant changes in the relative percentages of the types of materials spilled for 1990. However, the percentages of oils and waste spills are slightly higher in 1990 while gaseous and chemical spill percentages are slightly down. These differences are, in part, attributed to improved distinctions between material categories as opposed to actual changes in materials spilled.

**TABLE 4**

**THREE YEAR COMPARISON OF SPILLS BY MATERIAL**

| MATERIAL GROUP | YEAR | | | | | |
|---|---|---|---|---|---|---|
| | 1990 | | 1989 | | 1988 | |
| | SPILLS | % | SPILLS | % | SPILLS | % |
| Oils | 3144 | 52.4 | 2831 | 49.8 | 2136 | 50.8 |
| Chemicals | 1031 | 17.3 | 1118 | 19.6 | 798 | 19.0 |
| Gases | 717 | 12.0 | 864 | 15.2 | 546 | 13.0 |
| Wastes | 1032 | 17.2 | 763 | 13.4 | 602 | 14.3 |
| Unknown | 37 | 0.6 | 81 | 1.4 | 96 | 2.3 |
| Other | 30 | 0.5 | 32 | 0.6 | 24 | 0.6 |
| TOTALS | 5991 | 100.0 | 5689 | 100.0 | 4202 | 100.0 |

## QUANTITIES

Spill quantity information is presented by sorting liquid spills of the main material categories (oils, chemicals and wastes) according to the quantity groups, shown in Figure 7. Solid material spills have also been included by converting from kilograms to litres.

From Figure 7, it is clearly evident that a large proportion of spills reported to SAC involved oils and that many of these were relatively small quantities. The data points (i.e. the number of spills in each quantity group) at the base of the graph can be used to show that 477 oil spills (20% of the oil spills) were less than 10 litres, 1,435 (60%) were quantities less than 100 litres (roughly double the capacity of the fuel tank of an automobile) and 2,252 (93%) were less than 1000 litres (about the size of a home heating fuel oil tank). These figures were similar in previous years.

About 53% of the chemical spills were less than 100 litres. Chemical spill quantities are generally larger than oil spill quantities because they include spills of chemical solutions where the chemical of concern makes up only a portion of the reported spill quantity. This applies even more so to waste or wastewater spills which frequently consist of large quantities of water carrying low concentrations of chemicals and other contaminants. Only 16% of the waste spills were less than 100 litres.

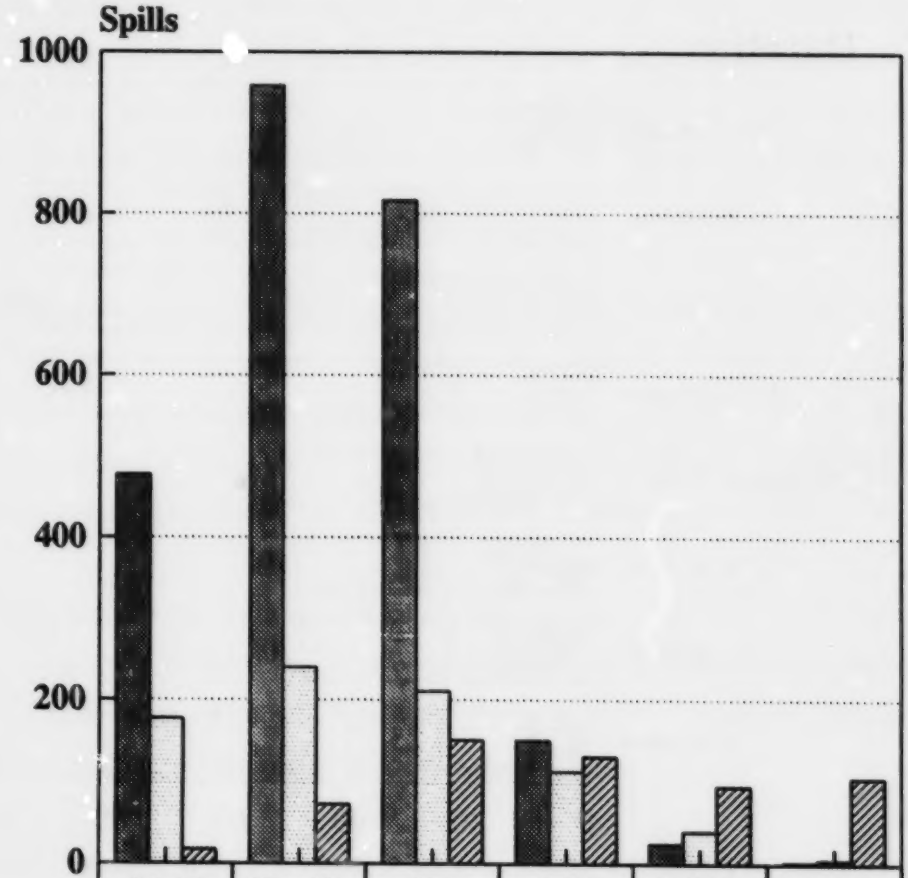
Figure 8 summarizes gaseous spills. Duration was selected as the summary parameter since the volume discharged was unknown for a large portion of these. The graph illustrates that smoke accounts for a significant number of gaseous spills especially in the 5 to 30 minute duration range. All duration ranges include a large proportion of "other gases" which include a variety of other substances such as ammonia, hydrogen sulphide, vinyl chloride, coke oven gases, and numerous other gaseous mixtures. Generally, the duration of release is not a good indicator of the potential impact of a spill, i.e., a longer

release does not mean a more serious release. In fact, of the 486 air spills for which duration was known, 15 were found to have confirmed impact and 10 of the 15 involved durations of 30 minutes or less.

## Figure 7

# Spill Volumes

## By Material Type



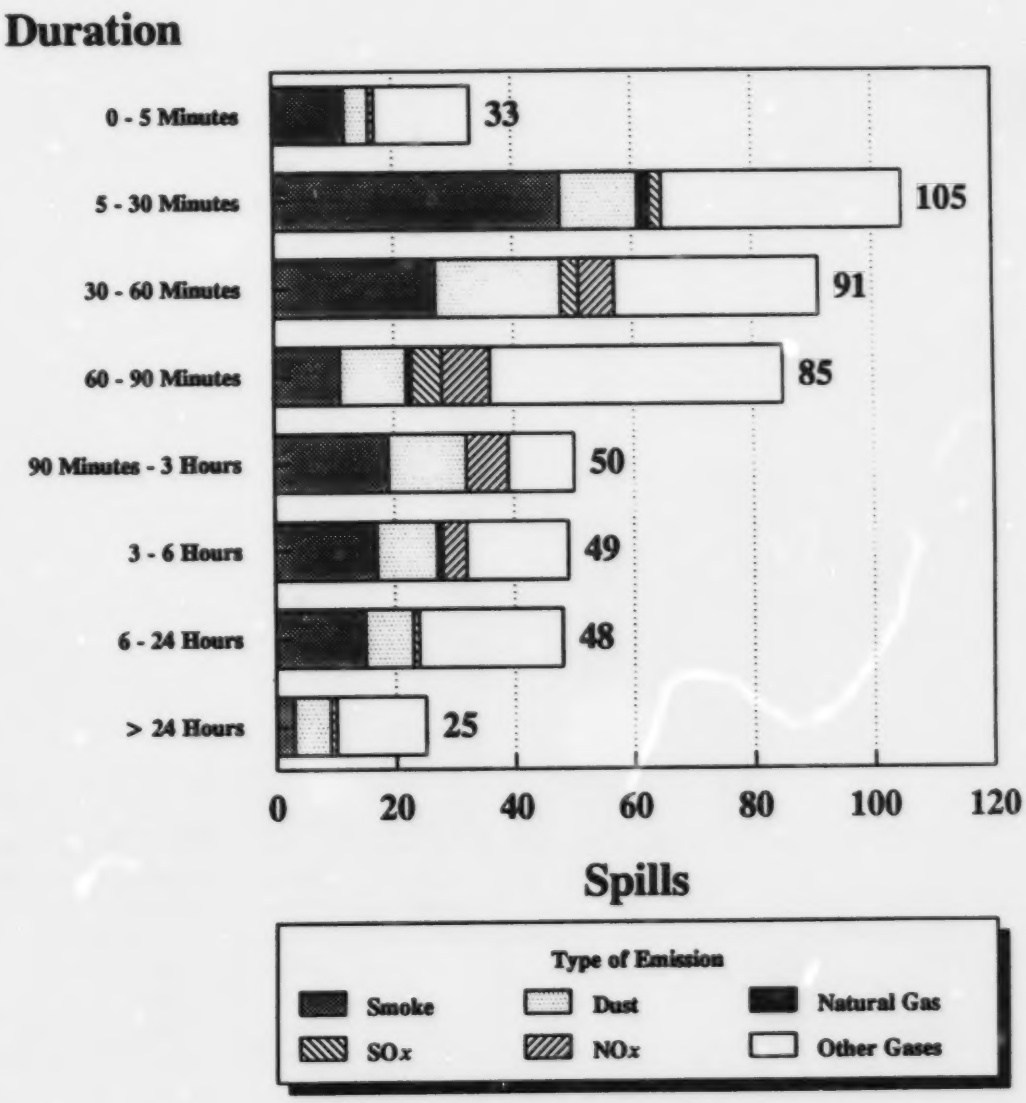

| | 0 to 10 Litres | 10 to 100 | 100 to 1 000 | 1 000 to 10 000 | 10 000 to 100 000 | > 100 000 |
|---|---|---|---|---|---|---|
| Oils | 477 | 958 | 817 | 150 | 24 | 2 |
| Chemicals | 177 | 240 | 211 | 112 | 39 | 5 |
| Wastes | 17 | 72 | 151 | 130 | 94 | 104 |

**Volume was known for 73% (3780) of the Spills involving these material groups**

## Figure 8

# Gaseous Spills

## By Duration of Emission




**Total Number of Gaseous Spills: 717**
**Duration was known for 486 (68%)**

## ENVIRONMENTAL IMPACT

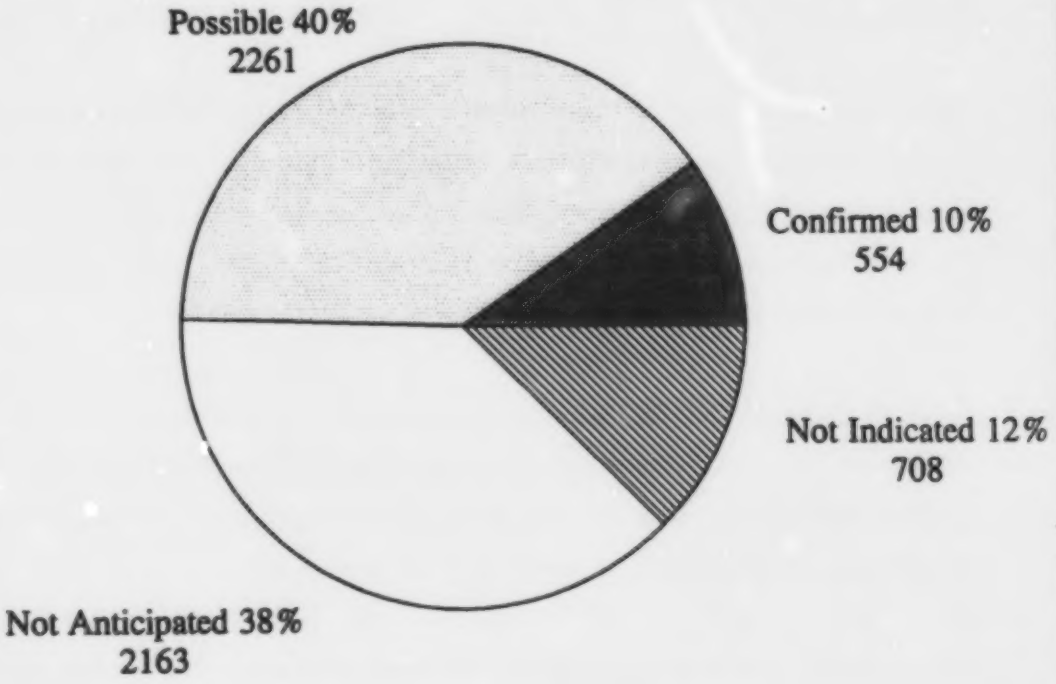
This report summarizes information on 5,686 reported spills. These spills involve a wide range of materials, quantities, and circumstances, all of which can contribute to the spill's effect on the environment. In order to provide some measure of the seriousness of a spill, the occurrence report form contains a field for documenting the likelihood of environmental impact, as well as a field which describes the nature of possible or confirmed impacts. The likelihood of impact and nature of "confirmed" impacts are summarized in Figures 9 and 10 respectively.

Adverse environmental impact was confirmed in 554 (just under 10%) of the 5,686 spills reported in 1990, as shown in Figure 9. A further 2,261 spills (40%) were recorded as having a potential impact or adverse effect. A similar number of spills (2,163 or 38%) were considered not to have any adverse environmental impact. Environmental impact information was not available for 708 or 12% of the total number of spills.

Figure 10 illustrates that for spills with a confirmed environmental impact, two-thirds involved soil contamination and one-fifth involved surface water contamination. The ten incidents which refer to impact on wild life consist of nine spills that resulted in confirmed fish kills and one that caused the deaths of some frogs.

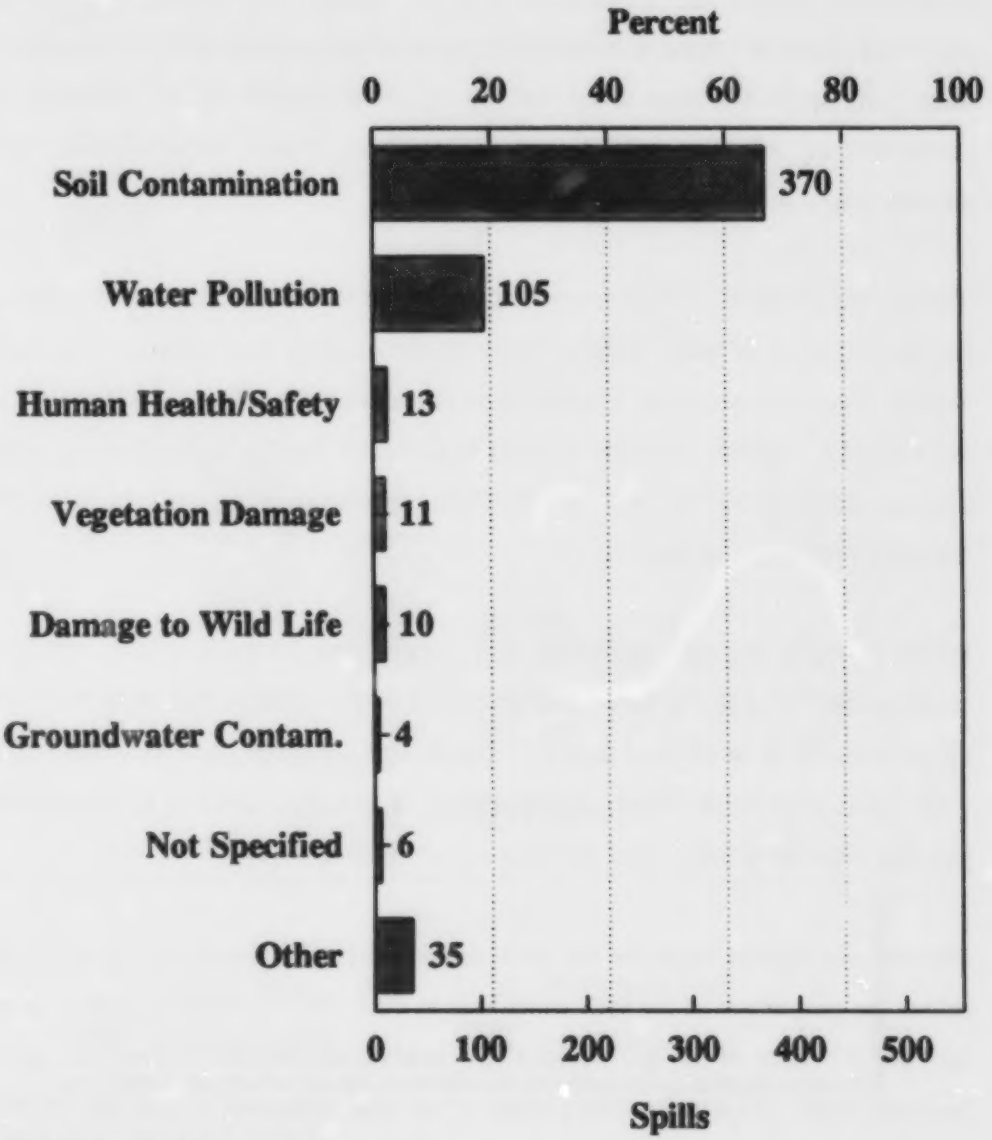
Thirteen spills resulted in human health and safety concerns. One incident involved a resident who died as a result of his misuse of an acid; four involved precautionary evacuations due to spills of gasoline, natural gas, ammonia and one unknown material; six spills were reported to have caused throat irritations; one spill caused a short-term exceedence of air quality standards in an urban area; and one spill involved a worker at a chemical plant who was exposed to a carbon tetrachloride release without injury.

## Figure 9
# Environmental Impact




**Reported Spills: 5 686**

## Figure 10
# Nature of Confirmed Impact




**Total Spills Where Environmental Impact Confirmed: 554**
**Total Spills: 5686**

## SPILL CLEANUP

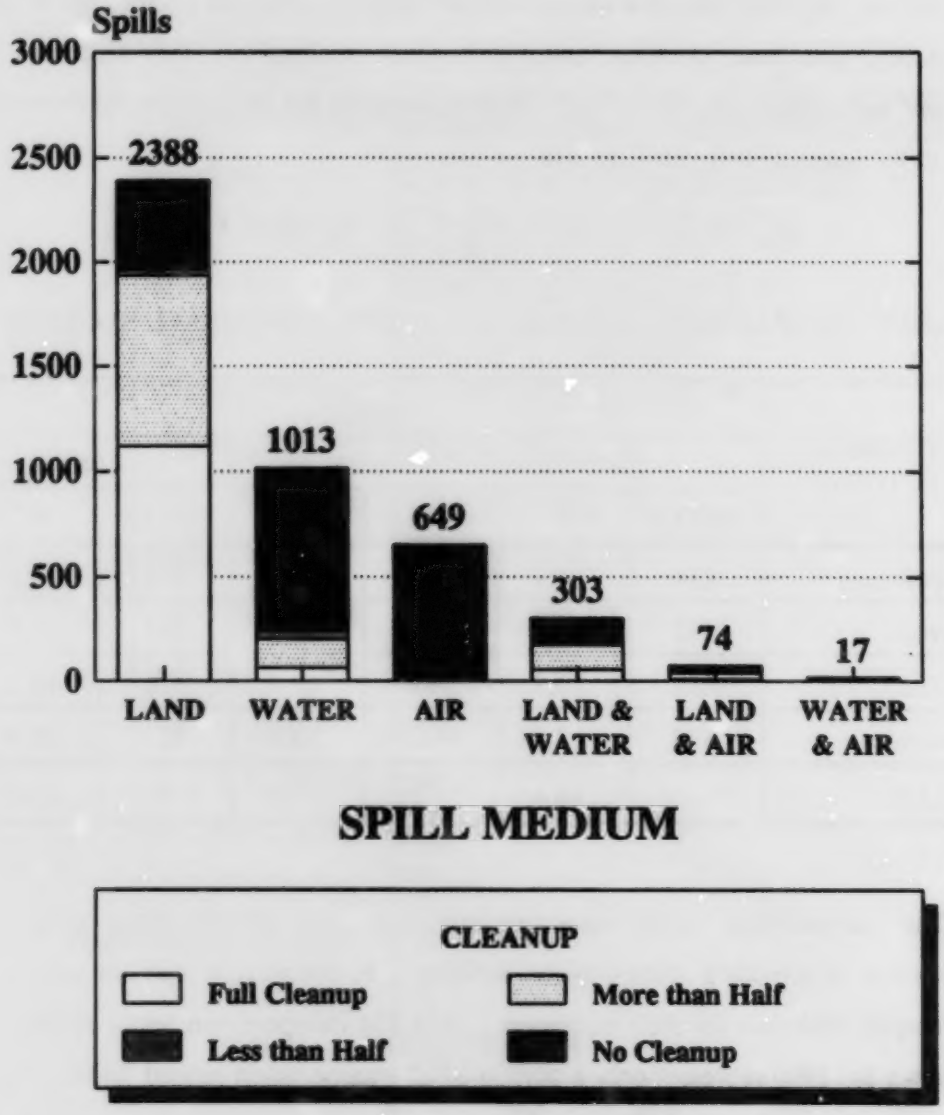
Part IX of the Environmental Protection Act requires that spills be cleaned up promptly and to the extent practicable. It places the primary cleanup responsibility on the discharger, that is the owner or person in control of a pollutant immediately prior to the spill. For the most part, spills are cleaned up directly by those responsible or indirectly by their contractors or industrial spill cleanup cooperatives. Public sector agencies provide a cleanup response on an as required basis.

The success of cleanup efforts is often related to the terrain and access to the spill site, soil conditions, types of water bodies involved, the quantity and nature of the material(s), weather and light conditions, availability of expertise and resources, and the time required to mobilize a response. Generally, spills to land have a much higher cleanup success rate than do spills to surface waters. Releases of gaseous substances to atmosphere are normally impossible to clean up.

Figure 11 shows the comparative cleanup success rates for spills to land, water, air, and combinations of these. It shows that about half of the spills to land were entirely cleaned up and about 80% were more than half cleaned up. By comparison only about 20% of the water spills were either cleaned up completely or partially, which is fairly consistent with globally reported success rates for cleaning up spills to water.

The cleanup success rates for the multiple medium spills shown in Figure 11 generally reflect the proportion of the spill which was to land. For example if a liquid is spilled to land and a portion of the spill escapes to a watercourse the spill is classified as a spill to land and water. Generally, that portion which was contained to land can be cleaned up while the portion that went to water can not be cleaned up.

## Figure 11
# Spill Cleanup by Medium




**Cleanup information available for 4444 Spills (78% of total)**

## SECTOR GROUPS AND SOURCES OF SPILLS

Figure 12, shown on the following page, summarizes spills by the various industrial and service sectors. The four industrial sectors with the largest numbers of reported spills were transportation, petroleum, chemical, and metallurgical. Collectively, they accounted for almost half of the spills reported to SAC. Table 5 compares the 1990 results for these four sectors to the previous two years' results.

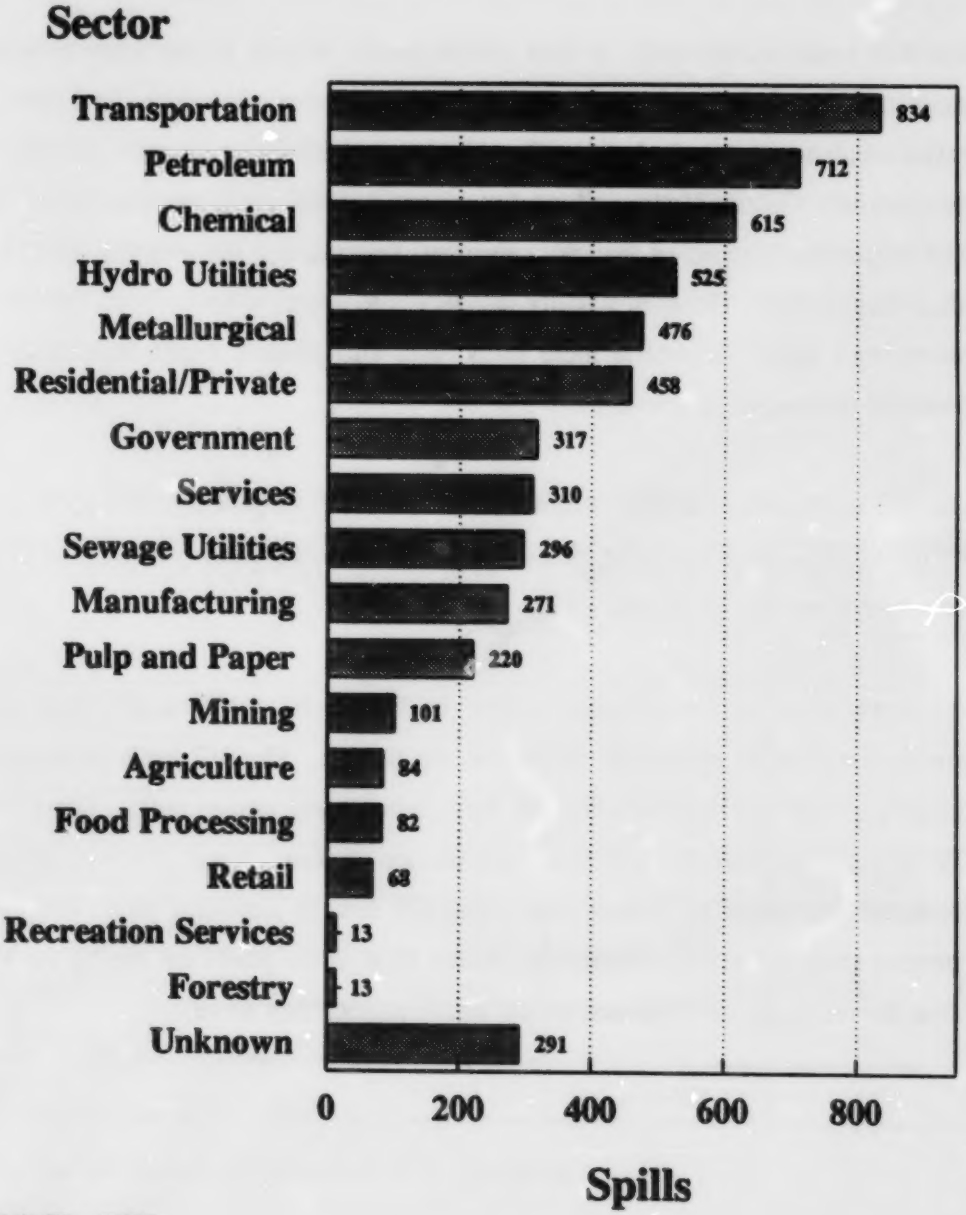
**TABLE 5**

**YEARLY COMPARISON OF HIGHEST RANKED INDUSTRIAL SECTORS**

| INDUSTRIAL SECTORS | YEAR | | | | | |
|---|---|---|---|---|---|---|
| | 1990 | | 1989 | | 1988 | |
| | SPILLS | % | SPILLS | % | SPILLS | % |
| Transportation* | 834 | 14.7 | 715 | 13.4 | 473 | 11.6 |
| Petroleum | 712 | 12.5 | 709 | 13.3 | 547 | 13.4 |
| Chemical | 615 | 10.8 | 585 | 10.9 | 416 | 10.2 |
| Metallurgical | 476 | 8.4 | 502 | 9.4 | 424 | 10.4 |
| TOTALS | 2 637 | 46.4 | 2 511 | 47.0 | 1 860 | 45.6 |

*The transportation sector represents companies and carriers whose only business is providing transportation services, i.e. commercial carriers who transport materials for their customers. The 834 transportation sector spills shown for 1990 represent only a portion of all transportation related spills.

## Figure 12
# Spills By Sector




**Reported Spills: 5686**

In addition to the four industrial sectors already discussed, Figure 12 shows significant numbers of spills from other sector categories including hydro utilities, the residential or private sector, the government sector, as well as spills from sewage utilities.

The 525 hydro utility spills involve discharges of insulating oils from capacitors or transformers in Ontario's vast electrical distribution system. Some are the direct result of traffic accidents or electrical storms in which ground level or pole mounted transformers are ruptured. Ontario Hydro and local municipal utilities are responsible for maintaining their respective portions of Ontario's electrical network and for cleaning up these spills when they occur. The hydro utility category also includes spills from Ontario power generating plants. Generally, these spills involved hydraulic fluids, lubricating oils or abnormal discharges of smoke.

The 458 spills categorized as being from the residential or private sector spills primarily involved discharges of operating fluids from privately owned motor vehicles and discharges from home heating fuel tanks.

The government sector category shown in Figure 12 includes all three levels of government, that is, municipal, provincial and federal. The 317 spills attributed to this category include discharges from government vehicles and storage tanks. There were also 296 spills from provincial and municipal sewage utilities. These involved abnormal or accidental discharges of sewage from about 420 sewage treatment plants and numerous pumping stations across the Province. About 60% of the plants are run by the Province while the remainder are operated by the municipalities they serve.

Figure 13 summarizes spills by 21 specified source categories. Some of the source coding categories, which are described in Appendix II, had to be grouped to permit the results to be presented graphically. All of the transportation source spills combined (i.e. non-fixed facility spills) accounted for 1,588 reported spills which is almost double the number of spills attributed to the transportation sector (834) in Table 5. The additional transportation related spills were from other sectors such as the petroleum, chemical and public sectors which engage in their own transportation activities. They also included operating fuel spills from private motor vehicles. The plant source category which includes a range of manufacturing and processing fixed facilities accounted for 1,492 spills (26.2% of all spills). By combining the source and sector data provided in Appendix VI these plants can be broken down as shown in Table 6.

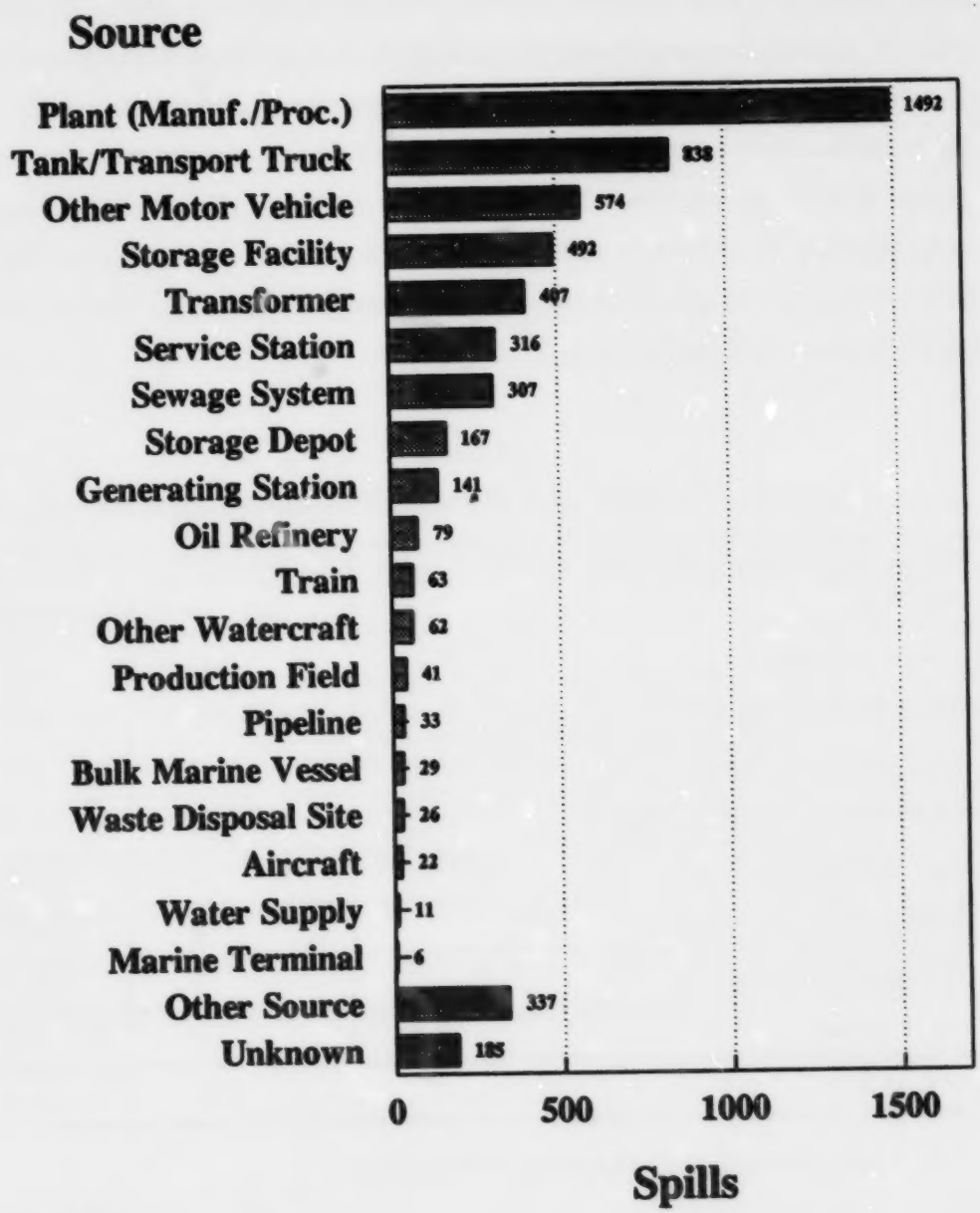
**TABLE 6**

**MANUFACTURING AND PROCESSING PLANT SUMMARY**

| MANUFACTURING/PROCESSING FACILITY SECTOR | NUMBER OF SPILLS | % OF ALL SPILLS |
|---|---|---|
| Chemical Plants | 543 | 9.5 |
| Metal & Steel Plants | 442 | 7.8 |
| Pulp and Paper Plants | 211 | 3.7 |
| General Manufacturing Plants | 208 | 3.7 |
| Food Processing Plants | 56 | 1.0 |
| Mining Processing Plant | 18 | 0.3 |
| Petroleum Facilities* | 7 | 0.1 |
| Other Sectors | 7 | 0.1 |
| TOTALS | 1492 | 26.2 |

* does not include 79 Petroleum Refinery Spills

## Figure 13
# Spills By Source




**Total Spills: 5686**

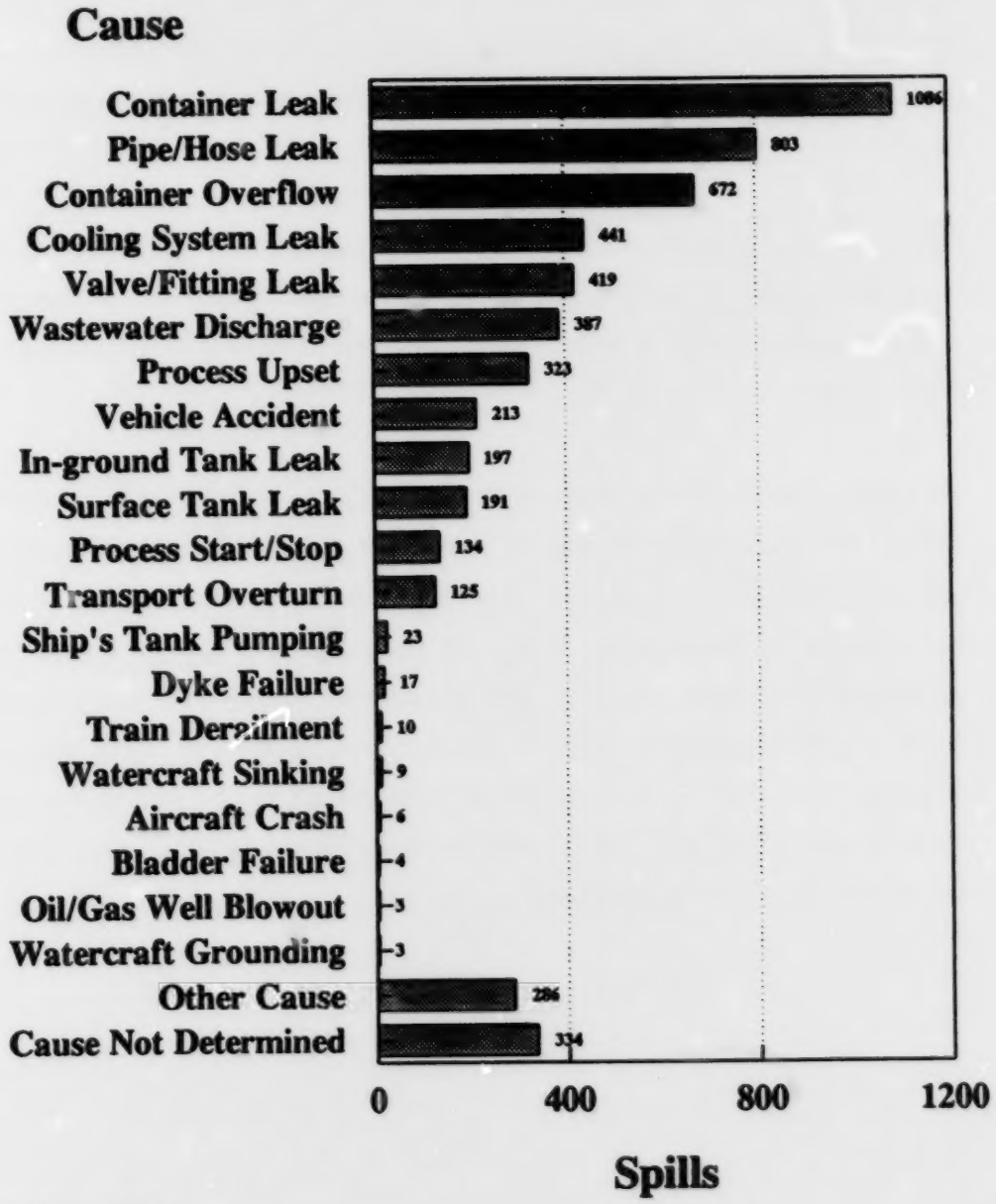
## CAUSE AND REASON

Figures 14 and 15 summarize the various causes and reasons attributed to spills reported to SAC during 1990. "Cause" refers to how a spill occurred and "reason" attempts to clarify the cause by identifying the primary contributing factor. For example, a spill may be caused by a transportation accident and the reason for the accident may be adverse road conditions.

Figure 14 shows that container leaks, pipe and hose leaks and container overflows caused nearly half of all spills, while Figure 15 shows that equipment failure and operator error were the major reasons for spills. These values are consistent with those presented in previous years.

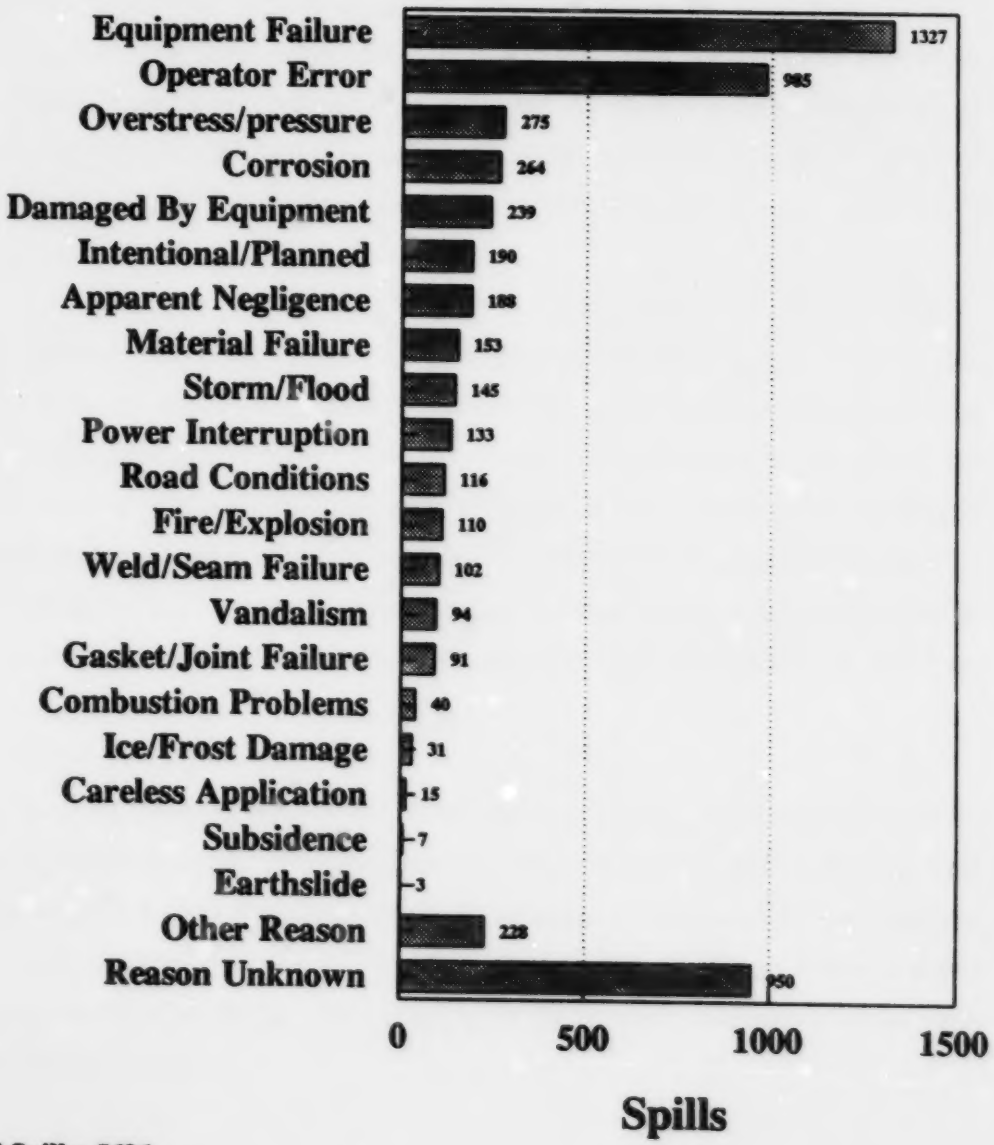
The various combinations of causes and reasons for spills are presented in Appendix VII. This appendix can be used in conjunction with the code descriptions provided to obtain additional information or to identify significant trends in the causes and reasons for spills. For example, to determine the number of spills involving tank or lagoon overflows resulting from operator error look up cause code 09 (overflows - tanks, lagoons) and reason code 02 (error) in Appendix IV. It can be seen that there were 334 spills that meet these two parameters. In a similar manner Appendix VII can be used to show that there were 169 tank or lagoon overflows resulting from equipment failure (reason code 10) and 46 resulting from process upsets (reason code 17).

## Figure 14
# Spills By Cause




**Reported Spills: 5686**

## Figure 15
# Spills By Reason




**Reported Spills: 5686**

# PART III

# SPILLS TO THE GREAT LAKES AND THEIR INTER-CONNECTING CHANNELS

This section of the report focuses on oil and chemical spills to the Great Lakes System. The importance of the Great Lakes cannot be overstated. They contain about 20% of all of the world's fresh water and serve an estimated 25 million people, along with an abundance of wild life. While it is presumed that spills constitute a very small fraction of total pollution loadings to the Great Lakes, the immediate impact of some spills can be significant near the source.

Oil and chemical spills which occurred during 1990 were analyzed closely to identify those which were spilled to the Great Lakes and the Interconnecting Channels. Spills from shore facilities, spills associated with the marine transportation mode which occurred on or to the waters of the Great Lakes System, and spills to sewers or drains which discharge directly to the waterbodies were included in this group. A summary of these spills is presented in Table 7 listing the total number of times oils and chemical materials were spilled to the various waterbodies of the Great Lakes. This table identifies 340 materials spilled to the Great Lakes.

Table 8 identifies the main industry and private sector groupings which contributed to the 333 spill incidents recorded. These incidents resulted in the 340 materials spilled that were identified in Table 8. Seven incidents involved two materials spilled at the same time, one incident each to Lakes Superior, Huron, Erie, Ontario, and St. Marys River, and two incidents in the St. Clair River. This accounts for the apparent discrepancy of the totals between Tables 7 and 8.

## TABLE 7

## OIL AND CHEMICAL SPILLS TO THE GREAT LAKES - MATERIAL SUMMARY

| MATERIAL GROUP | | WATERBODY | | | | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LAKE SUPERIOR | ST. MARYS RIVER | GEORGIAN BAY | LAKE HURON | ST. CLAIR RIVER | DETROIT RIVER | LAKE ERIE | NIAGARA RIVER | LAKE ONTARIO | ST. LAWRENCE RIVER | |
| OILS | Gasoline/Jet Fuel | 1 | 1 | 1 | 2 | 2 | 2 | 1 | | 6 | 3 | 19 |
| | Light Petroleum Oils | 5 | 2 | 1 | 8 | 12 | 4 | 8 | 2 | 26 | | 68 |
| | Heavy Petroleum Oils | 1 | 1 | | | 12 | 1 | 9 | 2 | 14 | | 40 |
| | Other Petroleum Oils | 1 | 3 | | 2 | 9 | 6 | 7 | | 29 | 4 | 61 |
| | Non-Petroleum Oils | 1 | | | | 2 | | | | 2 | | 5 |
| | SUB-TOTAL | 9 | 7 | 2 | 12 | 37 | 13 | 25 | 4 | 77 | 7 | 193 |
| CHEMICALS | Acids | 1 | | | 1 | 1 | 1 | 1 | | 5 | 38 | 48 |
| | Bases | 2 | | | | 3 | | | | 2 | 4 | 11 |
| | Halogenated Solvents | | | | | 4 | | | | | | 4 |
| | Non-Halogenated Solvents | | | | | 13 | | | | 6 | | 19 |
| | Other Organic | | | 1 | | 10 | | | | 7 | 3 | 21 |
| | Other Inorganic | 3 | 2 | | | 7 | | 1 | 1 | 15 | 15 | 44 |
| | SUB-TOTAL | 6 | 2 | 1 | 1 | 38 | 1 | 2 | 1 | 35 | 60 | 147 |
| TOTAL | | 15 | 9 | 3 | 13 | 75 | 14 | 27 | 5 | 112 | 67 | 340 |

## TABLE 8

## OIL AND CHEMICAL SPILLS TO THE GREAT LAKES - SECTOR SUMMARY

| SECTOR | WATERBODY | | | | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | LAKE SUPERIOR | ST. MARYS RIVER | GEORGIAN BAY | LAKE HURON | ST. CLAIR RIVER | DETROIT RIVER | LAKE ERIE | NIAGARA RIVER | LAKE ONTARIO | ST. LAWRENCE RIVER | |
| Chemical | | | | | 32 | 1 | | 2 | 2 | 58 | 95 |
| Food Processing | | | | | | | | | 1 | | 1 |
| Municipal Government | | | | | | | 1 | | 1 | | 2 |
| Provincial Government | 1 | | | 2 | 8 | | 10 | 2 | 9 | | 32 |
| General Manufacturing | | | | | 1 | | | 1 | 3 | 1 | 6 |
| Metallurgy | | 1 | | | | 2 | | | 44 | | 47 |
| Mining | | | | 1 | | | | | | | 1 |
| Petroleum | | | | 1 | 7 | | 2 | | 7 | | 17 |
| Pulp & Paper | 8 | 1 | | | 1 | | | | | 1 | 11 |
| Residential/Private | 1 | | 3 | 4 | 1 | 1 | 2 | | 5 | 2 | 19 |
| Retail | | 1 | | | | 1 | | | | 1 | 3 |
| Service Industry | | 1 | | 1 | 2 | 2 | | | 2 | 1 | 9 |
| Transportation | 3 | | | 3 | 20 | 3 | 8 | | 17 | 1 | 55 |
| Unknown | 1 | 4 | | | 1 | 4 | 3 | | 20 | 2 | 35 |
| TOTAL | 14 | 8 | 3 | 12 | 73 | 14 | 26 | 5 | 111 | 67 | 333 |

Figure 16 reflects the number of oil and chemical spills to the Great Lakes respectively in volume groups similar to those presented in Part II of the report. About 90% of these spills were in quantities of less than 1000 litres each. This is a further indication that, for the majority of spills reported, each involves relatively small quantities.

As indicated in Part II of this report, oil spills are more difficult to deal with when they occur in open waterbodies. Currents encountered in the interconnecting channels of the Great Lakes make cleanup even more difficult. Spills of chemicals add another level of difficulty to cleanup efforts, and spills of soluble chemicals, chemical suspensions, or solutions are essentially impossible to clean up. These generalities are supported by Table 10 which summarizes information on cleanup achieved for oil and chemical spills to the Great Lakes for which clean up information was available. Cleanup details were not known for 81 of the 340 materials spilled to the Great Lakes System.

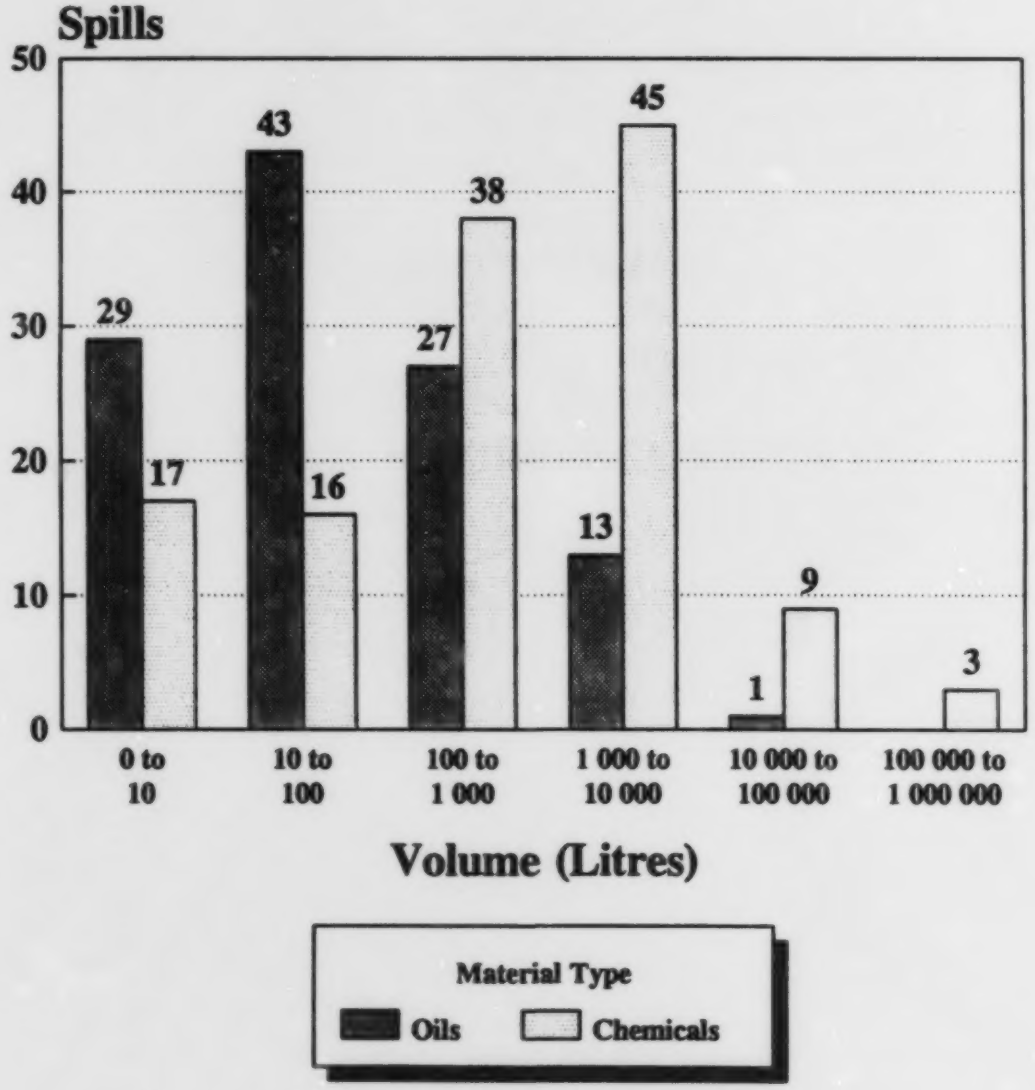
**TABLE 9**

**GREAT LAKES SPILL CLEANUP**

| CLEANUP | OILS | CHEMICALS |
|---|---|---|
| no cleanup achieved or possible | 78 | 102 |
| less than half of spilled material cleaned up | 14 | 2 |
| more than half cleaned up | 42 | 4 |
| full cleanup | 14 | 3 |
| TOTAL | 148 | 111 |

## Figure 16

# Great Lakes Spill Volumes
## By Material Type




**Volume was known for 259 of 340 (76%) Spills involving Oils and Chemicals**

# APPENDIX I

# SAMPLE OCCURRENCE REPORT

MINISTRY OF THE ENVIRONMENT
OCCURRENCE REPORT INFORMATION SYSTEM

Oct. 25,1991
PAGE: 1

# OCCURRENCE REPORT

| Received By | Region No. | S.A.C. No. | I.E.B. No. |
|---|---|---|---|
| JOHN RITCHIE | 9002020346- | 9003726- | |

Occurrence Type: SPILL
Subtype: LAND
Action Class: 1:[25] 2:[12] 3:[ ]

| | Date | Time (24 hr) |
|---|---|---|
| Occurrence: | 90/04/12 | 02:30 |
| Report to SAC: | 90/04/12 | 04:39 |
| Report to MOE: | 90/04/12 | 04:39 |
| MOE at Scene: | 90/04/12 | 15:30 |

Reported by (Name/Organization)
PAUL WILSON
WATERLOO R.M.
Tel. No.: 519-650-8267 EXT.:
Alt. No.: - - EXT.:
Address:

Postal Code:

Environmental Officer Assigned:
BRYAN RAYNER

Location of Occurrence:
Region..: 2 WEST CENTRAL
District: CA CAMBRIDGE
Municipality: 25101
CAMBRIDGE CITY
PINEBUSH RD

Source:
PRIVATE OWNER
MOTOR VEHICLE

Source: [MV] Sector: [RS] SIC: [9741]
UTM:
N: [ ] E: [ ] Zone: [17]

Brief Summary:
VEHICLE COLLIDED WITH SIGNPOST, PUNCTURING FUEL TANK. FUEL SPILLED ALONG 3 KM STRETCH OF PINEBUSH RD (WEST FROM WELLINGTON CTY RD #32). OPP, REGION ON SCENE. REGION APPLIED SAND, WILL RECOVER MATERIAL LATER TODAY. SOME PARTS OF GRAVEL ROAD MAY HAVE TO BE EXCAVATED. ABATEMENT REPORT INDICATED THAT THE CITY OF CAMBRIDGE RECOVERED THE SAND AND DUG UP ANY CONTAMINATED SOIL FROM DITCH AND DISPOSED OF THE MATERIAL AT THE CAMBRIDGE LANDFILL. SITE WAS INSPECTED BY BRYAN THE NEXT DAY AND CLEAN-UP WAS SATISFACTORY.

If there are related reports, list them in the summary preceeded by 'RELATED'.

Follow-up Action: [Y] Abatement [N] IEB
SITE VISIT - CLEAN-UP COMPLETE.

Suspected Violation Code: [ ]
No Further Action By: [Y] Abatement [Y] File Closed [Y] IEB

IEB Investigator Assigned

| Report Prepared by: | Date | BF Date | Person-Days | MBR | Function |
|---|---|---|---|---|---|
| BRYAN RAYNER | 90/11/09 | | | | |

| District Officer | Date | Reviewing Officer | Date |
|---|---|---|---|
| JOHN COOKE | 90/11/09 | | |

List numbers showing: A - routing of the original, B - distribution of copies.

A: [ ][ ][ ][ ][ ]
B: [ ][ ][ ][ ][ ][ ]

1. Investigator/ERP
2. Distr.officer/file
3. SAC
4. Reg.Dir or Mgr
5. IEB Reg. Super.
6. IEB H.O./file

Region No.: 9002020346- S.A.C. No.: 9003726- IEB No.:

---

Material 1: DIESEL FUEL — Code..: 13
Amount: 180 L — UN No.: 1202
Material 2: — Code..:
Amount: — UN No.:
Material 3: — Code..:
Amount: — UN No.:

---

Cause.....: OTHER TRANSPORTATION ACCIDENT — Code..: 08
Reason.....: ERROR — Code..: 02

Contact: [N] ERP Name: Date:
Callout: [ ] SAC Operator: Time: :

Controller of Material: — Code..:
Owner of Material.....: — Code..:
Agencies Involved.....: OPP, REGION, CAMBRIDGE WORKS DEPT

---

Clean up and Restoration Carried out by:
[N] Controller [N] Owner [Y] Other: CAMBRIDGE WORKS DEPT.

% Cleaned up: 100.00 Estimated Cost: $
Were Directions or Approval Given Under EPA Part IX [N] Regulation 11/82 [N] | Emergency Generator No.

Waste Class: NOT APPLICABLE — Code..: 000
Hauler: CITY OF CAMBRIDGE — Code..:
Disposal Site: CAMBRIDGE WASTE DISPOSAL SITE — Code..: A140104

---

Environmental Impact: CONFIRMED | Nature of Impact: Soil contamination — Code..: 07

---

People/Business Damaged
(Other than to Owner/Controller)
CITY OF CAMBRIDGE
Nature of Damage: Cleanup/RESTORATION costs — Code..: 03

---

# APPENDIX II

# ORIS CODING CATEGORIES

## OCCURRENCE TYPE CODES

---

**S** **Spill**

sub category:

- **L** Land
- **W** Water
- **A** Air

---

**N** **Notification**

sub category:

- **01** Condition of Operation
- **02** C of A Non-Compliance
- **03** Order Non-Compliance

---

**C** **Complaint**

sub category:

- **01** Odour
- **02** Noise
- **03** Dust/Particulate
- **04** Smoke
- **05** Litter/Waste
- **06** Water Pollution
- **07** Drinking Water
- **08** Vegetation Damage
- **99** Other

---

**O** **Other**

## MATERIAL CODES

**10 Series: OIL**

| | |
|---|---|
| 11 | Crude |
| 12 | Gasoline/Jet Fuel/Kerosene |
| 13 | Light Petroleum Oils: Motor, Diesel, Furnace, Mineral |
| 14 | Heavy Petroleum Oils: Bunker, Lubricating, Tar, Asphalt |
| 15 | Other Petroleum Oils |
| 16 | Non-Petroleum Oils |

**20 Series: CHEMICAL**

| | |
|---|---|
| 21 | Acids |
| 22 | Bases |
| 23 | Halogenated Solvents |
| 24 | Non-Halogenated Solvents |
| 25 | Pesticides |
| 26 | Polychlorinated Biphenyls (PCB's) |
| 27 | Other Organic |
| 28 | Other Inorganic |

**30 Series: GASES/PARTICULATE**

| | |
|---|---|
| 31 | Smoke |
| 32 | Dust/Particulate |
| 33 | Nitrous Oxides ($NO_x$) |
| 34 | $SO_2$ |
| 35 | Natural |
| 36 | Other Gases |

**40 Series: WASTES**

| | |
|---|---|
| 41 | Liquid Industrial |
| 42 | Hazardous |
| 43 | Non-hazardous Solid |
| 44 | Sewage |
| 45 | Agricultural |
| 46 | Other Wastes |

**90 Series: MISCELLANEOUS**

| | |
|---|---|
| 96 | Feed & Foodstuff |
| 97 | Not Applicable |
| 98 | Unknown |
| 99 | Other |

## ENVIRONMENTAL IMPACT - NATURE OF IMPACT CODES

| | | | |
|---|---|---|---|
| 01 | Human Health or Safety | 06 | Surface Water Pollution |
| 02 | Fish Kill | 07 | Soil Contamination |
| 03 | Other Kill or Injury | 99 | Other Damage |
| 04 | Vegetation Damage | | |
| 05 | Groundwater Pollution | | |

---

## Nature of Damage Codes

(Used to flag incidents of potential interest to
the Environmental Compensation Corporation)

| | | | |
|---|---|---|---|
| 01 | Personal Injury | 04 | Business/Wages Loss |
| 02 | Property Damage | | |
| 03 | Cleanup/Restore Cost | 99 | Other Damage |

## SECTOR CODE DESCRIPTION

| | | |
|---|---|---|
| **AG** | **Agriculture** | - includes co-ops, farms, ranches |
| **CH** | **Chemical** | - chemical processing facilities that produce basic chemicals or feed stocks (incl. derivative products) and associated bulk transport vehicles |
| **FD** | **Food Processing** | - canners, meat/fish packers (NOT distribution/retail) |
| **FO** | **Forestry** | - forestry activities, operations vehicles |
| **Government** | **- GM (Municipal)**<br>**- GF (Provincial)**<br>**- GF (Federal)** | - governmental and quasi-governmental bodies/organizations |
| **GN** | **General Manufacturing** | - light manufacturing; metal plating, fabricating, textiles, etc. |
| **ME** | **Metallurgy** | - steel and other metal manufacturing |
| **MN** | **Mining** | - mining operations and associated equipment/vehicles |
| **PE** | **Petroleum** | - includes bulk transport vehicles and service stations |
| **PP** | **Pulp & Paper** | - processing facilities of pulp and paper industry |
| **RE** | **Recreation** | - facilities which provide relaxation |
| **RS** | **Residential/Private** | - house, cottages, vehicles, boats, aircraft |
| **RT** | **Retail** | - diversified retail establishments |
| **SI** | **Service Industry** | - dry cleaners, waste disposal, contractors, hotels, etc. including libraries and educational institutions. |
| **TA** | **Transportation** | - carriers whose ONLY business is providing transportation services |
| **OT** | **Other** | - sector not otherwise defined |
| **UK** | **Unknown** | - sector not determined |

## SOURCE CODE DESCRIPTION

| | | | |
|---|---|---|---|
| **AC** | **Aircraft** | - | all vehicles that fly (except hovercraft) |
| **BC** | **Bulk Marine Carrier** | - | carriers of solid bulk cargo |
| **MT** | **Marine Tanker** | - | carriers of liquid/gaseous cargo |
| **MR** | **Marine Terminal** | - | commercial waterfront facility |
| **PC** | **Pleasure Craft** | - | privately owned recreational watercraft |
| **OW** | **Other Watercraft** | - | other commercial or gov't watercraft |
| **TR** | **Train/Railroad** | - | all vehicles that run exclusively on rails |
| **TT** | **Tank Truck** | - | road vehicles carrying bulk cargo in liquid, gaseous, powdered or other pumpable forms |
| **TP** | **Transport Truck** | - | general cargo transport road vehicle |
| **MV** | **Motor Vehicle** | - | road vehicle not otherwise defined |
| **PF** | **Production Field** | - | spills of raw materials at point of extraction |
| **PL** | **Pipeline** | - | bulk transportation lines (excluding "in-plant" piping) |
| **RF** | **Petroleum Refinery** | - | petroleum refining facilities |
| **SD** | **Storage Depot** | - | bulk storage facilities from which materials are distributed for sale |
| **SS** | **Service Station** | - | incl. airports, marinas and motor vehicle facilities |
| **OS** | **Other Storage Facility** | - | storage for on-site/private use (industrial plants, farms, residences) |
| **HP** | **Heat/Power Plant** | - | includes electric generating stations |
| **OP** | **(Other) Plant** | - | manufacturing/processing facilities (except refineries) |
| **ST** | **Sewage Treatment** | - | includes sewage treatment plants and lagoons |
| **SW** | **Sewer** | - | municipal/industrial wastewater collection systems |
| **TF** | **Transformer** | - | electrical transformers, capacitors etc. |
| **WD** | **Waste Disposal** | - | landfill sites, industrial waste treatment plant |
| **WS** | **Water Supply** | - | water treatment/distribution systems |
| **OT** | **Other** | - | source not otherwise defined |
| **UK** | **Unknown** | - | source not determined |

## CAUSE CODES

(answers the question, "what happened?")

| | | |
|---|---|---|
| 01 | **Collision (Watercraft)** | - accidents involving watercraft only |
| 02 | **Grounding (Watercraft)** | - watercraft running aground |
| 03 | **Sinking Watercraft** | - other than from collision or grounding |
| 04 | **Ship's Tank/Bilge Pumping** | - wastewater discharge from watercraft |
| 05 | **Derailment** | - accidents where railcars or engines leave the rails |
| 06 | **Crash (Aircraft)** | - applies only to aircraft accidents |
| 07 | **Overturn (Truck/Trailer)** | - trucks and tractor trailers only |
| 08 | **Other Transport Accident** | - road vehicle accidents other than above |
| 09 | **Overflow (Tanks, Lagoons)** | - overfilling tanks, containers and dikes |
| 10 | **Pipe and Hose Leak** | - from piping systems but not cooling systems |
| 11 | **Valve/Fitting Leak/Failure** | - leaks from specific parts of equipment containers or pipelines |
| 12 | **Bladder Leak** | - leaks from flexible storage containers |
| 13 | **Tank Leak (Underground)** | - buried storage tanks and associated piping |
| 14 | **Container Leak, Fuel Tanks, Barrels** | - includes bottles, boxes, vats & vehicle fuel/cargo tanks (other than cause 13 and 20) |
| 15 | **Discharge/Bypass to Watercourse** | - accidental or unusual variation of wastewater discharges to watercourses |
| 16 | **Well Blowout (Oil and Gas)** | - applies to oil or gas wells |
| 17 | **Process Upset** | - an usual variation in the regular discharge of a contaminant to air due to a fluctuation in the process |
| 18 | **Dyke failure (Lagoons, Ponds)** | - storage pond, lagoon wall failure |
| 19 | **Cooling System Leak** | - applies to transformers, capacitors, vehicle radiators, nuclear reactors, or other power plants |
| 20 | **Tank Leak (Surface)** | - storage tanks (fixed), tank-farm, heating systems (incl. delivery to disconnected filler-pipes) |
| 21 | **Start Ups/Shutdowns/Interruptions** | - operating condition change |
| 98 | **Unknown** | - cause of release not determined |
| 99 | **Other Discharges** | - to air/land/water, not otherwise defined |

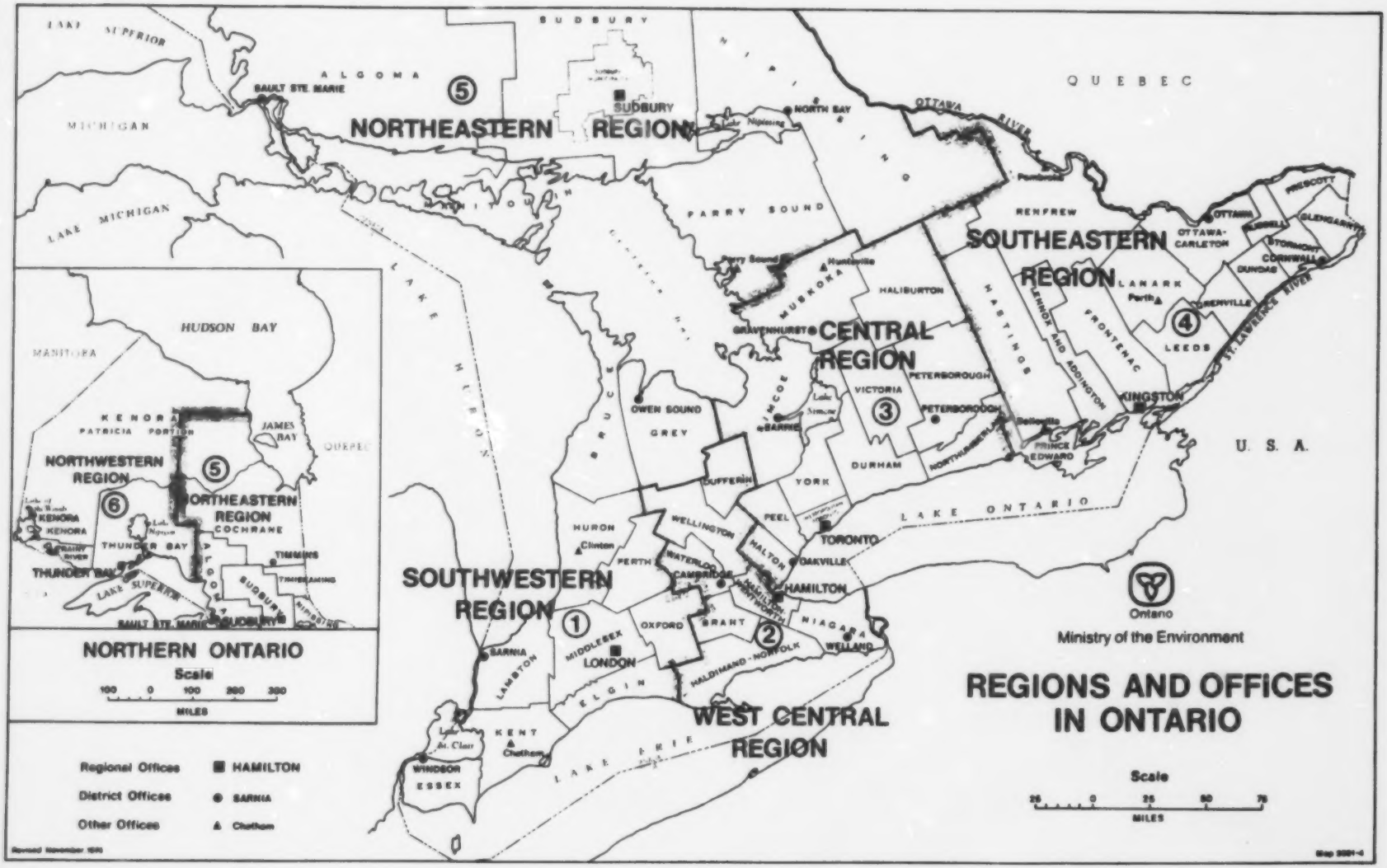
## REASON CODES

(answers the question, "why it happened")

| | REASON FOR INCIDENT | - | the primary contributing factor to the cause |
|---|---|---|---|
| 01 | **Intentional/Planned** | - | intentional or planned release |
| 02 | **Error** | - | releases due to mistakes |
| 03 | **Vandalism** | - | illegal/deliberate releases (incl. sabotage) |
| 04 | **Ice/Frost** | - | releases resulting from freezing, frost heave, the weight of snow/ice, or falling ice |
| 05 | **Power Interruption** | - | releases resulting from loss of power |
| 06 | **Fire/Explosion** | - | releases resulting from fires/explosions (not releases that cause a fire or explosion) |
| 07 | **Storm/Flood** | - | releases resulting from storm/flood/lighting (incl. compulsory wastewater bypasses due to high flows) |
| 08 | **Earthquake, slide** | - | releases resulting from NATURAL earth movements |
| 09 | **Subsidence** | - | release through settling of disturbed soils |
| 10 | **Equipment Failure** | - | malfunctions in system components (e.g. brakes valves) |
| 11 | **Weld/Seam Failure** | - | releases from point where material is joined to form the wall of a pipe/tank or other vessel |
| 12 | **Overstress/Overpressure** | - | any form of overloading wherein the design strength of container was exceeded |
| 13 | **Corrosion** | - | includes all forms of corrosion (internal/external) |
| 14 | **Material Failure** | - | poor design or substandard materials |
| 15 | **Damage by Moving Equipment** | - | containers damaged by vehicles |
| 16 | **Gasket/Joint** | - | any point of connection (except reason 11) |
| 17 | **Negligence (Apparent)** | - | release due to lack of diligence |
| 18 | **Adverse Road Condition** | - | road faults, ice/snow, material on road |
| 19 | **Combustion Problems** | - | stack emissions due to poor burning conditions |
| 97 | **Careless Application** | - | misuse of pesticides, fertilizers, sludge |
| 98 | **Unknown** | - | primary reason for release not determined |
| 99 | **Other** | - | primary reason for release not otherwise defined |

## MINISTRY DISTRICT CODE TABLE

| MINISTRY REGION | DISTRICT CODE | DISTRICT |
|---|---|---|
| Southwest | LD | London |
| | OS | Owen Sound |
| | SR | Sarnia |
| | WD | Windsor |
| West Central | CA | Cambridge |
| | HA | Hamilton |
| | WL | Welland |
| Central | BA | Barrie |
| | MH | Muskoka/Haliburton |
| | OA | Oakville |
| | PT | Peterborough |
| | TE | Toronto East |
| | TW | Toronto West |
| | YD | York Durham |
| Southeast | BV | Belleville |
| | CW | Cornwall |
| | KG | Kingston |
| | OT | Ottawa |
| | PM | Pembroke |
| Northeast | NB | North Bay |
| | PA | Parry Sound |
| | SD | Sudbury |
| | SM | Sault Ste. Marie |
| | TI | Timmins |
| Northwest | KN | Kenora |
| | TB | Thunder Bay |

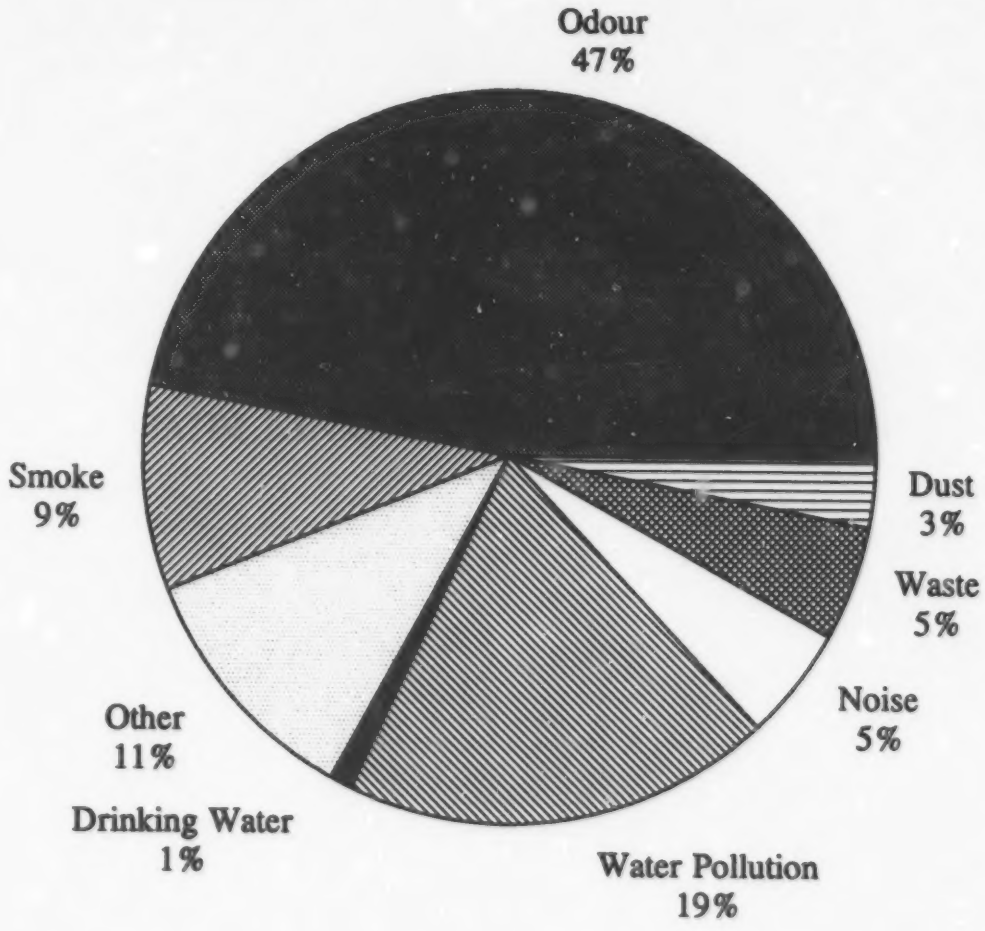

NORTHEASTERN REGION
SOUTHEASTERN REGION
CENTRAL REGION
SOUTHWESTERN REGION
WEST CENTRAL REGION
NORTHWESTERN REGION
NORTHEASTERN REGION
NORTHERN ONTARIO
Scale
MILES
Regional Offices
HAMILTON
District Offices
SARNIA
Other Offices
Chatham
REGIONS AND OFFICES IN ONTARIO
Ontario
Ministry of the Environment
U. S. A.
QUEBEC
MICHIGAN
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ONTARIO
LAKE ERIE
HUDSON BAY
MANITOBA
OTTAWA RIVER
ST. LAWRENCE RIVER

# APPENDIX III

# COMPLAINTS BY TYPE

## Appendix III

# Complaints* By Type



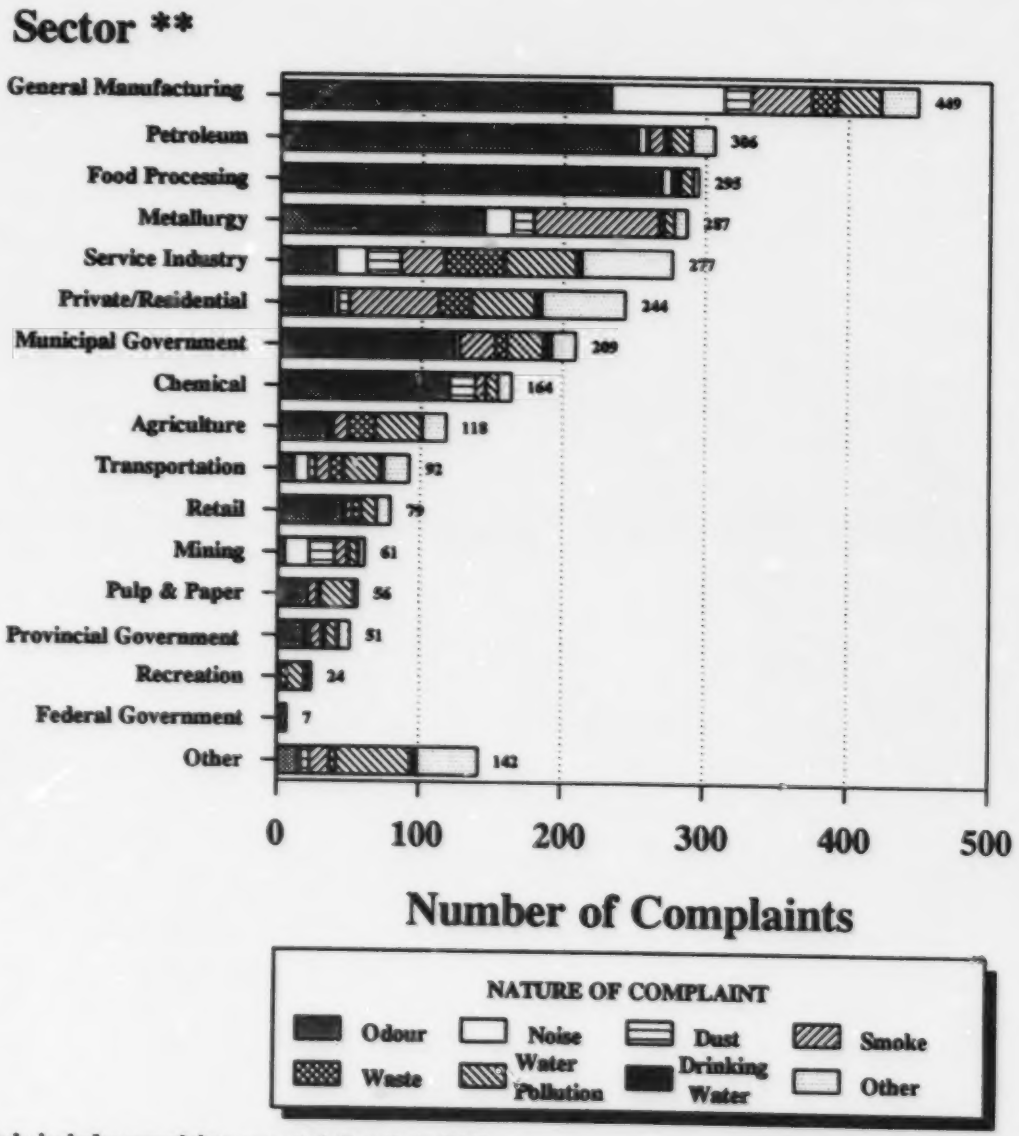

*** A total of 4068 Complaints were reported to SAC in 1990. This total does not include Complaints reported directly to the Ministry's District and Regional Offices**

# APPENDIX IV

# COMPLAINTS BY TYPE AND SECTOR

## Appendix IV

# Complaints* By Type & Sector




* Only includes complaints reported directly to SAC

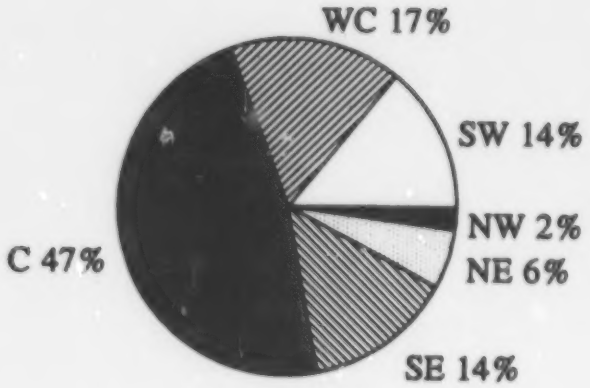
** Sector was not known for 1207 complaints

# APPENDIX V

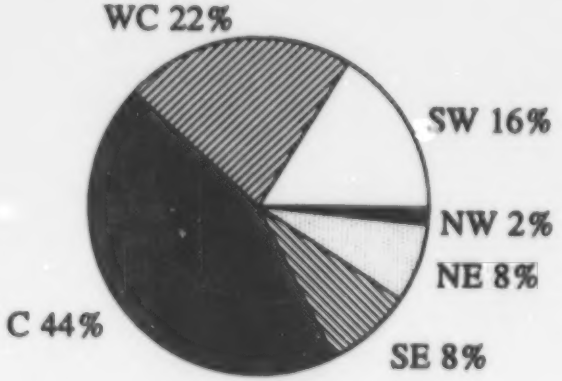
# POPULATION vs. COMPLAINTS BY MOE REGION

Appendix V

# Population vs. Complaints* By MOE Region




Population Distribution




Complaint Distribution

* Only includes complaints reported directly to SAC
Population statistics derived from 1988
Ministry of Revenue enumeration data.

# APPENDIX VI

# SPILLS BY SECTOR AND SOURCE

# APPENDIX VI
## SPILLS BY SECTOR AND SOURCE

| SOURCE | SECTOR | | | | | | | | | | | | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AG | CH | FD | FO | GF | GM | GN | GP | ME | MN | PE | PP | RE | RS | RT | SI | TA | UK | |
| AC | | | | 3 | 2 | | | 2 | | | | | | 5 | | | 10 | | 22 |
| BC | | | | | | | | | | | | | | | | | 14 | | 14 |
| HP | | | | | | 1 | | 131 | | | | | | | | 9 | | | 141 |
| MR | | | | | | | | | | | 2 | | | | | 2 | 2 | | 6 |
| MT | | | | | | | | | | | | | | | | | 15 | | 15 |
| MV | 8 | 5 | 4 | 8 | | 52 | 8 | 72 | 1 | 3 | 4 | 2 | 1 | 136 | | 61 | 116 | 93 | 574 |
| OP | 2 | 543 | 56 | | | | 208 | | 442 | 18 | 7 | 211 | | | | 4 | | 1 | 1492 |
| OS | 22 | 6 | 1 | | 8 | 25 | 29 | 28 | 2 | 11 | 36 | 2 | 4 | 214 | 20 | 54 | 36 | | 498 |
| OT | 37 | 5 | 3 | | 12 | 24 | 11 | 55 | 1 | 7 | 3 | | 4 | 51 | 15 | 93 | 8 | 9 | 338 |
| OW | | | | | | | | 1 | | | 1 | | 1 | | | 3 | 30 | | 36 |
| PC | | | | | | | | | | | | | | 26 | | | | | 26 |
| PF | | | | | | | | | | 37 | 4 | | | | | | | | 41 |
| PI | | | | | | | | | | | 33 | | | | | | | | 33 |
| RF | | | | | | | | | | | 79 | | | | | | | | 79 |
| SD | 3 | 4 | | | 1 | 4 | 2 | 4 | | | 125 | 1 | | | 3 | 6 | 14 | | 167 |
| SS | | | | | | | | | | 1 | 275 | | 1 | | 23 | 10 | | | 310 |
| ST | | | | | 1 | 124 | 1 | 133 | 20 | 10 | | | 1 | 15 | | 2 | | | 307 |
| SW | | 1 | | | | 29 | | 10 | 3 | 7 | | | | | | 2 | 3 | | 55 |
| TF | | 2 | | | | 161 | | 232 | 1 | 1 | | | | 8 | | 1 | | | 406 |
| TP | 3 | 29 | 13 | 2 | 2 | 1 | 9 | 8 | 3 | 2 | 2 | 4 | | 1 | 3 | 20 | 284 | | 386 |
| TR | | 4 | | | | | | 1 | | | | | | | | | 58 | | 63 |
| TT | 9 | 15 | 5 | | 1 | 1 | 3 | 1 | 3 | 3 | 141 | | 1 | | 4 | 21 | 244 | | 452 |
| UK | | | | | | | | | | | | | | | | | | 188 | 188 |
| WD | | 1 | | | | 2 | | | | 1 | | | | | | 22 | | | 26 |
| WS | | | | | | 7 | | 2 | | | | | | 2 | | | | | 11 |
| TOTAL | 84 | 615 | 82 | 13 | 27 | 431 | 271 | 680 | 476 | 101 | 712 | 220 | 13 | 458 | 68 | 310 | 834 | 291 | 5686 |

*See Appendix II for description of Source and Sector Codes

| SECTOR | SOURCE |
|---|---|
| AG Agriculture | AC Aircraft |
| CH Chemical | BC Bulk Marine Carrier |
| FD Food Processing | MT Marine Tanker |
| FO Forestry | MR Marine Terminal |
| Government GM (Municipal) | PC Pleasure Craft |
| GP (Provincial) | OW Other Watercraft |
| GF (Federal) | TR Train/Railroad |
| GN General Manufacturing | TT Tank Truck |
| ME Metallurgy | TP Transport Truck |
| MN Mining | MV Motor Vehicle |
| PE Petroleum | PF Production Field |
| PP Pulp & Paper | PL Pipeline |
| RE Recreation | RF Petroleum Refinery |
| RS Residential/Private | SD Storage Depot |
| RT Retail | SS Service Station |
| SI Service Industry | OS Other Storage Facility |
| TA Transportation | HP Heat/Power Plant |
| OT Other | OP (Other) Plant |
| UK Unknown | ST Sewage Treatment |
| | SW Sewer |
| | TF Transformer |
| | WD Waste Disposal |
| | WS Water Supply |
| | OT Other |
| | UK Unknown |

* See Appendix II for a complete Description of these Codes.

# APPENDIX VII

# SPILLS BY CAUSE AND REASON

# APPENDIX VII
## SPILLS BY CAUSE AND REASON

| REASON | CAUSE | | | | | | | | | | | | | | | | | | | | | | | TOTALS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 98 | 99 | |
| 01 | | | | 5 | | | | | | | 2 | | | 27 | 38 | | 17 | | | 2 | 40 | 1 | 58 | 190 |
| 02 | | 2 | | 8 | 3 | 1 | 59 | 81 | 334 | 95 | 73 | | 8 | 179 | 31 | | 22 | | 10 | 17 | | 5 | 57 | 985 |
| 03 | | | | 1 | | | | | 1 | 8 | 6 | | | 42 | 3 | | | | 3 | 12 | | 1 | 17 | 94 |
| 04 | | | | | | | | | 1 | 7 | 5 | | 1 | 7 | 1 | | | 1 | 3 | 3 | | | 2 | 31 |
| 05 | | | | | | | | | 11 | 1 | 3 | | | | 75 | | 24 | | 4 | 2 | 13 | | | 133 |
| 06 | | | 1 | | | | | 4 | | 3 | | 1 | 1 | 24 | 1 | | 15 | | 25 | 3 | | 7 | 25 | 110 |
| 07 | | 1 | 2 | | | | | | 21 | | | | | 14 | 23 | | | 1 | 66 | 2 | | 3 | 12 | 145 |
| 08 | | | | | | | | | | | | | | 2 | 1 | | | | | | | | | 3 |
| 09 | | | | | 1 | | | | | 2 | | | | 1 | | | | 3 | | | | | | 7 |
| 10 | | | 1 | | | 1 | 3 | 12 | 169 | 237 | 190 | 1 | 15 | 183 | 125 | 1 | 149 | | 135 | 27 | 52 | 2 | 24 | 1327 |
| 11 | | | | | | | | | | 33 | 11 | | 4 | 29 | | | | | 17 | 8 | | | | 102 |
| 12 | | | | | | | | | 22 | 130 | 23 | 1 | 4 | 18 | 9 | | 23 | 1 | 39 | 2 | | 1 | 2 | 275 |
| 13 | | | | | | | | | | 29 | 4 | | 110 | 66 | | | | 1 | 7 | 47 | | | | 264 |
| 14 | | | | | | | | | | 69 | 18 | | 6 | 32 | | | 8 | 2 | 9 | 8 | | | 1 | 153 |
| 15 | | | | | | | | 25 | | 35 | 5 | | 6 | 89 | | | | 1 | 69 | 6 | | 1 | 2 | 239 |
| 16 | | | | | | | | | | 27 | 34 | | 2 | 10 | 1 | | 3 | | 11 | 3 | | | | 91 |
| 17 | | | | 2 | | | | | 46 | 15 | 9 | | 5 | 52 | 19 | | 2 | | 1 | 7 | | 1 | 29 | 188 |
| 18 | | | | | | | 40 | 50 | | 7 | | | | 19 | | | | | | | | | | 116 |
| 19 | | | | | | | | | | | | | | | | | 27 | | | | 11 | 1 | 1 | 40 |
| 97 | | | | | | | | | | | | | | | 7 | | | | | | | | 8 | 15 |
| 98 | | | 4 | 7 | 5 | 4 | 20 | 34 | 38 | 77 | 24 | 1 | 30 | 253 | 29 | 1 | 21 | 6 | 29 | 35 | 7 | 309 | 16 | 950 |
| 99 | | | 1 | | 1 | | 3 | 7 | 29 | 28 | 12 | | 5 | 39 | 24 | 1 | 12 | 1 | 13 | 7 | 11 | 2 | 32 | 228 |
| TOTALS | 0 | 3 | 9 | 23 | 10 | 6 | 125 | 213 | 672 | 803 | 419 | 4 | 197 | 1086 | 387 | 3 | 323 | 17 | 441 | 191 | 134 | 334 | 286 | 5686 |

*See Appendix II for description of Cause and Reason Codes

| CAUSE | | REASON | |
|---|---|---|---|
| 01 | Collision (Watercraft) | 01 | Intentional/Planned |
| 02 | Grounding (Watercraft) | 02 | Error |
| 03 | Sinking Watercraft | 03 | Vandalism |
| 04 | Ship's Tank/Bilge Pumping | 04 | Ice/Frost |
| 05 | Derailment | 05 | Power Interruption |
| 06 | Crash (Aircraft) | 06 | Fire/Explosion |
| 07 | Overturn (Truck/Trailer) | 07 | Storm/Flood |
| 08 | Other Transport Accident | 08 | Earthquake, slide |
| 09 | Overflow (Tanks, Lagoons) | 09 | Subsidence |
| 10 | Pipe and Hose Leak | 10 | Equipment Failure |
| 11 | Valve/Fitting Leak/Failure | 11 | Weld/Seam Failure |
| 12 | Bladder Leak | 12 | Overstress/Overpressure |
| 13 | Tank Leak (Underground) | 13 | Corrosion |
| 14 | Container Leak, Fuel Tanks, Barrels | 14 | Material Failure |
| 15 | Discharge/Bypass to Watercourse | 15 | Damage by Moving Equipment |
| 16 | Well Blowout (Oil and Gas) | 16 | Gasket/Joint |
| 17 | Process Upset | 17 | Negligence (Apparent) |
| 18 | Dyke failure (Lagoons, Ponds) | 18 | Adverse Road Condition |
| 19 | Cooling System Leak | 19 | Combustion Problems |
| 20 | Tank Leak (Surface) | 97 | Careless Application |
| 21 | Start Ups/Shutdowns/Interruptions | 98 | Unknown |
| 98 | Unknown | 99 | Other |
| 99 | Other Discharges | | |

* See Appendix II for a complete Description of these Codes.